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Convention Number

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Program of P. S. A. Convention

Cleveland, Ohio

Friday, October 25th, 1940

11:00 a.m. Registration at Carter Hotel

11:45 a.m. Get-together Interval

1:00 p.m. Leave for visit to P.S.A. International Salon at Cleveland Museum of Art

2:15 p.m. Leave for Nela Park, for a visit to General Electric Company Laboratories and Plant

At Nela Park—Paper by **Mr. R. E. Worstell,** of General Electric

Subject: *"Characteristics and Use of Fluorescent Lamps in Photography"*

At Nela Park—Tea served to ladies of the party by officers and members of Cleveland Women's Photographic Society

4:45 p.m. Leave for return trip to Carter Hotel

6:30 p.m. Informal Get-together in Rainbow Room

7:00 p.m. **Prof. Charles Hodgman,** Case School of Applied Science

Subject: *"Color Perception in Relation to Color Photography"*

7:30 p.m. **Dr. L. A. Jones,** Eastman Kodak Company

Subject: *"Effective Camera Speeds of Photographic Negative Materials,"* by Dr. L. A. Jones and C. N. Nelson

8:00 p.m. **Mr. Rowland S. Potter, P.S.A.,** Defender Photo Supply Company

Subject: *"Gradation Control in Sensitized Projection Papers"*

8:30 p.m. **Mr. Lloyd E. Varden, A.R.P.S., P.S.A.,** Agfa-Ansco

Subject: *"Practical and Sensitometric Studies on the Emmermann Process"*

9:00 p.m. Papers Program Adjournment

Viewing of Exhibitions at Carter Hotel, Terminal Concourse, and visit to Clubrooms and Gallery of Cleveland Photographic Society

Saturday, October 26th

8:00 a.m. Registration at Carter Hotel

8:30 a.m. Meeting of General Assembly

9:00 a.m. Opening of Business Session

Speech of welcome by Mayor Burton of Cleveland

Greetings from Cleveland Photographic Society by Vice-President Herbert M. Howison

Introduction of President Frank Liuni by Convention Chairman and taking up regular order of business

11:45 a.m. **Professor James E. Bliss,** Western Reserve University

Subject: *"Putting Intellect and Art into the Non-Theatrical Film"*

12:15 p.m. **Valentino Sarra, P.S.A.,** Chicago

Subject: *"Photography in Modern Advertising"*

12:45 p.m. Adjournment of Papers Program

1:15 p.m. Luncheon in Rainbow Room, followed by talk by **Mr. Adolf Fassbender, F.R.P.S., P.S.A.,** of New York

Subject: *"Control in Composition"*

2:45 p.m. **Mr. Keith Henney, P.S.A.,** Editor Photo Technique

Subject: *"Practical Color Photography"*

3:15 p.m. **Mr. T. J. Maloney,** Publisher U. S. Camera

Subject: *"Photography in the Photographic Publishing Business"*

3:45 p.m. Recess and Get-together

4:15 p.m. **Mr. G. T. Eaton,** Eastman Kodak Company

Subject: *"The Elimination of Hypo from Photographic Images,"* by J. I. Crabtree, G. T. Eaton and L. E. Muehler

4:45 p.m. **Mrs. Helene Sanders, F.R.P.S., P.S.A.,** New York Institute of Photography

Subject: *"Portrait Lighting"*

6:00 p.m. Adjournment of Papers Program

7:00 p.m. Informal Get-together

7:30 p.m. Banquet of the Society; **Dr. Max Thorek, F.R.P.S., Hon.P.S.A.,** Toastmaster. Dress optional

Honors Committee awards with responses

Address by **Dr. Fairfield Osborn,** President of New York Zoological Society

Subject: *"What Photography Means to the Natural Sciences."*

Sunday, October 27th

8:30 a.m. Meeting of Board of Directors

10:30 a.m. Meeting of Pictorial Division

11:30 a.m. **Mr. Irving Carson Young, A.R.P.S.,** The Haloid Company, Chicago

Subject: *"Some Contributions of Photography to Modern Life and Culture"*

12:00 m. **Mr. Roy E. Stryker,** U. S. Department of Agriculture

Subject: *"Photography—A Tool for the Social Scientist"*

12:30 p.m. Adjournment of Papers Program

1:00 p.m. Luncheon—followed with talk by **Mr. Tappan Gregory, P.S.A.**

Subject: *"Wild Animal Photography"*

3:00 p.m. Visit to Art Museum for viewing of P.S.A. International Salon

Abstracts of 1940 Convention Papers

R. E. WORSTELL, Nela Park Engineering Department, General Electric Company—*"Characteristics and Use of Fluorescent Lamps in Photography"*

October 25—3 P.M.

Nothing since the introduction of color films has aroused in the photographic field such widespread interest as has the fluorescent lamp. This new light source with its range of spectral characteristics, its freedom from radiant heat and disturbing glare has found a fertile field of application in photography.

The paper and demonstration will include characteristics of fluorescent lamps and their use in portrait, commercial, color, and motion picture photography.

CHARLES D. HODGMAN, Associate Professor of Physics, Case School of Applied Science, Cleveland, Ohio—*"Color Perception in Relation to Color Photography"*

October 25—7 P.M.

The rapid increase in the use of color photography has aroused a very general interest in regard to the accuracy of color reproduction. Before passing final judgment on this question in general or in any particular case there is need of a clear understanding of the limitations of color perception.

Color photographs are often disappointing because particular areas of color represented seem wholly incorrect when in actual fact the stimulus received from the area may be very similar to that received from the original.

Various factors contribute to this and one of the more important is the fact that impressions received are modified by the background. In the case of any particular color area the background is often very greatly modified in its effect by the photographic reproduction of a limited portion of a scene. Another difficulty is the fact that one is likely to make incorrect assumption as to the nature of the color stimulus received. We often assume a pre-knowledge of the color of objects, as for example that snow is white or that foliage is green, when many factors such as color of illumination, reflections from other color areas or intervening haze may modify the actual stimulus received. Careful study of conditions in individual cases will often assist in the appreciation of results obtained.

The possibility of a considerable control of the final results in order that they may reproduce more exactly the actual or assumed colors exists in any three-color process in which separate positive images are involved, and each image may be treated separately. The modern monopack method offers no such ease of control but in the case of transparencies such as small Kodachrome slides a limited degree of modification may frequently be made by the use of weak filters of appropriate color inserted with the film between the glass covers.

Complete accuracy in photographic color reproduction is not attainable but an analysis of the conditions of color perception will increase our appreciation and enjoyment of color photography.

DR. L. A. JONES, Physics Department, Research Laboratories, Eastman Kodak Company—*"Effective Camera Speeds of Photographic Negative Materials,"* by Dr. L. A. Jones and C. N. Nelson

October 25—7:30 P.M.

Numerous sensitometric methods for determining the speeds of negative photographic materials have been suggested and tried since the early proposal of the inertia system by Hurter and Driffield in 1890. Years of photographic experience have revealed that many of these methods give speed values in great discord with the results of practical picture taking.

It should be made clear that a sensitometric criterion of speed can be accepted as significant and correct only if it is in agreement with a rational concept of what photographic speed really should mean. The criterion advocated in this paper has underlying it a basic concept of speed which is of great importance and practical significance. According to this concept, *photographic speed is inversely proportional to the minimum camera exposure which will yield an excellent print.* In the negative-positive process, this means that the negative is to be judged purely on its ability to make a high quality print. The search for a sensitometric criterion of negative film speed is, therefore, not merely a physical problem but is a *psychophysical* problem requiring much statistical work to determine the relation between print quality and negative exposure.

This time-consuming work was undertaken by the Kodak Research Laboratories in 1936. By 1939, a wide variety of negative materials used in the amateur field had been studied. For each material, a speed value based upon print judgment was obtained by the statistical psychophysical method. From the sensitometric, D-log E curves of these negative materials, it was possible to determine the inertia speeds, the speeds based on various fixed densities, the speeds based on fixed gradient, etc. These speeds were compared with the print judgment speeds but no satisfactory agreement was found. An examination of the gradient or contrast characteristics of the D-log E curves revealed, however, that speeds based, not upon a fixed gradient but upon a *relative* gradient, were in good agreement with the statistically-determined print judgment speeds. It was established that the minimum useful gradient on the toe of the D-log E characteristic curve was proportional to the average gradient measured over the part of the curve occupied by the negative, the proportionality constant being 0.30. The new sensitometric speed criterion, therefore, defines speed as $1/E_{0.30}$, where $E_{0.30}$ is the exposure in meter-candle-seconds corresponding to the point on the D-log E curve where the gradient is three-tenths of the average gradient over a log E interval of 1.5. The speed values obtained are termed fractional gradient speeds. Special instruments have been developed which greatly facilitate the measurements required. Fractional gradient speeds have a very practical and useful significance in that they mark the minimum negative exposure which can be given without detriment to print quality.

The utility of these new speed numbers can be even more appreciated when it is realized that by combining the fractional gradient speed value with a suitable safety factor we have, at last, obtained a reliable and simple means of calculating exposure meter ratings or camera exposure ratings for general use which will give the photographer the best possible chance of obtaining a high percentage of successful pictures.

ROWLAND S. POTTER, Vice-President, Defender Photo Supply Company—"*Gradation Control in Sensitized Projection Papers*"

October 25—8 P.M.

In this paper will be discussed methods hitherto used for controlling gradation and the progress in manufacturing sensitized papers having such characteristics that it is possible to control gradation from soft to hard by variation in color of light used for exposure.

LLOYD E. VARDEN, A.R.P.S., Editor, Agfa Diamond—"*Practical and Sensitometric Studies on the Emmermann Process*"

October 25—8:30 P.M.

Tone expansion processes, such as the Person Process, have held the interest of pictorial photographers since their origin. However, not until Emmermann proposed a practical and direct tone expansion method were such schemes of much value. The Emmermann Process has been described as an automatic masking or dodging method for projection printing. The mask is formed by partially exposing a developer-soaked sheet of paper on the enlarger easel, permitting the image to develop up fully in the shadows before completing the exposure. The shadow-mask protects the dark areas of the print from appreciably greater exposure when the second exposure is made, thereby holding detail in the print throughout the scale. "Old-timers" early observed this phenomenon in making P.O.P. prints. The darkening in the shadows during the early stages of sun or arc light exposure acted as a mask preventing the detail in the shadows from blocking up.

Due to a tendency toward softening the gradation by soaking the emulsion before exposure, a grade of paper harder than would be normally used is advised.

Previous literature indicated that the Emmermann procedure led to reversal in a majority of cases. Sensitometric studies clearly showed reversal effects. Recent studies have shown the tendency toward reversal to be characteristic of only certain papers and not of others. At least two papers of American manufacture exhibited no reversal effects. Accordingly, it is likely that the Emmermann Process can become more widely adapted in America when required.

JAMES E. BLISS, D.D.S., School of Dentistry, Western Reserve University, Cleveland, Ohio—"*Putting Intellect and Art Into the Non-Theatrical Film*"

October 26—11:45 A.M.

Since the earliest days of human history, man has endeavored to record events of his daily life in some pictorial form. With the discovery of photography—the photographic process—man's ability to preserve the milestones of his life was greatly expanded. When the 35mm. continuous film strips of flexible celluloid were perfected by the Eastman Kodak Company in 1889, the dream of motion in graphic arts was realized.

Based upon the persistence of vision principle, the Edison Kinetoscope in 1889 was the first instrument to successfully portray motion in pictures by the use of this roll type of film.

Thirty-four years later, in 1923, the new 16mm. film and equipment brought the "Eighth Art" within the reach of many. The amateur field was broadened by the introduction of another narrow film and camera line in 1933. This eight millimeter series has brought film cost to an even lower level than that of the sixteens. There is today, a motion picture outfit for nearly every purse and purpose in the non-theatrical, or the purely home movie field.

What are the opportunities for the use of amateur or "sub-standard" film widths? The answer is this: If you have a story to tell; an event to record; or a principle to teach—let your movie camera help you!

Serious film production requires definite plans and purposes. A thorough understanding of cinematic story telling is essential as well as a complete knowledge of movie tools and how to use them. Intelligence and artistic appreciation are partners in this work.

For convenience, this advanced film field can be divided into what can be called "The Three P's of Movie Making":—

I. Preparation
II. Production
III. Presentation.

PREPARATION includes the recognition and comprehensive use of the fundamental structures of movie technique, and the important task of scenarization of the story to be filmed. Scene composition and "sequence thinking" must become a part of conscious and subconscious planning. Arthur L. Gale has written in his book, "Make Your Own Movies":—"Make a movie every time you pick up your camera. Don't forget, a movie can consist of as few as three or four scenes if they begin at a definite point and carry the subject to a logical ending."

Camera technique for screen accents and scene or sequence punctuations must be mastered. Their use, tempered by thought and discretion, add finesse and perfection. Film plans may be simple or elaborate, but the best motion pictures are built on sound foundations.

PRODUCTION embraces the selection or expansion of movie equipment, and the arduous task of using these tools properly for interpretation of the film script. It also refers to the responsibilities of intelligent use of editing lay out.

PRESENTATION is the final bond in the chain that links scenario to the screen. Too often this phase of movie making is too lightly treated. The choice of a projector and screen, and the balance between these two is frequently badly misconceived. We have all seen picture presentations where a grave injustice has been done to a fine film from a too dim projection bulb, poor lens equipment, or the wrong screen surface for the film presented.

Serious movie making *is* fun, but it is also work! The degree of excellence that is attained is in direct proportion to the amount of intellect and art put into every phase of the work. The field of advanced amateur movie making is wide open—the possibilities are unlimited.

VALENTINO SARRA, Noted Illustrator—"*Photography in Modern Advertising*"

October 26—12:15 P.M.

Mr. Sarra will discuss the many uses of photography by the advertising photographer. The talk will be illustrated with a number of his unusual compositions and color studies.

ADOLF FASSBENDER, F.R.P.S., Noted Pictorialist and Teacher—"*Control in Composition,*" The official paper of the Pictorial Division.

October 26—2 P.M.

The presentation will be confined strictly to "Pictorial Photography," and "Straight" or "Record Photography" or "Purism" will not be considered. The paper will deal especially with landscape, seascape, genre and other pictorial human interest subject matters. Such subjects as still life, table top and character studies, although pictorial, will be omitted since the control of composition with such material is easily achieved when one is acquainted with the basic rules of composition and light. In the former group, however, control is much more complicated. There are many reasons for this—the immovability of the subject matter, the problem of light, and the possibility of a swift change in the scene.

The most difficult problem is the changes which take place in the after-treatment and processing of film and print. Complete control of composition depends primarily on a thorough knowledge of the technique of photography. For example, light, a variable and deceiving factor, can ruin a composition completely unless it is fully understood and controlled, by producing undesirable densities in the wrong part of the film image. It can make a dark and unimportant object bright enough to produce an over-exposed area in the film and consequently a great density and bright area in the print. This may be contrary to the photographer's impression of the scene and certainly contrary to his wish since his primary motive was to create a monochrome picture which he saw and felt.

If light changes the picture, what, then of color? Color does not react on any film as it reacts on the eye. Color sensitivity is not the same on all films. The results both on the film and the final print will differ from the actual scene. Unimportant colored areas may shine brightly because of the difference in color sensitivity between eye and film. The tone scale is out of balance causing the composition to suffer as tone scale, balance and emphasis must be in proper relation to the motif. Other changes in the print can be brought about by under or over exposure, too soft a film or developer, etc. There is also a lack of the 3rd dimension in a print and a resulting lack of separation of the subject matter.

Another important factor in composition is "Simplification." By control tones can be subdued and simplified, emphasis can be built up, undesirable objects eliminated and the beauty of the composition enhanced. All of this takes patience, imagination and perseverance; the photographer who cannot exercise control labours under a decided disadvantage.

At its best a photograph is not a true rendition of a given scene. Limitations of the negative film and the positive print make it essential to balance the factors in order to regain what is lost or changed and thus recreate the picture of our vision as closely as possible.

KEITH HENNEY, Editor, Photo Technique—"*Practical Color Photography*"

October 26—2:45 P.M.

Mr. Henney will discuss the matter of making prints directly from the subject as well as from Kodachrome by the several methods—outlining the importance of accurate standardization and control, and will say something about the future of color.

T. J. MALONEY, Publisher of U. S. Camera—"*Photography in the Photographic Publishing Business*"

October 26—3:15 P.M.

In this talk Mr. Maloney will discuss the various vicissitudes of the photographic publishing business. He will tell of his experiences in getting out a magazine as well as an annual. The publicity that his magazine has given photography at the San Francisco and New York World's Fairs will be briefly mentioned.

G. T. EATON, Research Laboratories, Eastman Kodak Company—"*The Elimination of Hypo from Photographic Images,*" by J. I. Crabtree, G. T. Eaton and L. E. Muehler

October 26—4:15 P.M.

The abstract of this paper is reproduced on page 6 of this issue.

MRS. HELENE SANDERS, F.R.P.S., Head Instructor of the Portrait Division, New York Institute of Photography—"*Portrait Lighting*"

October 26—4:45 P.M.

Starting with Basic Lighting, Mrs. Sanders will give a demonstration of all the different steps, through 45 , a

(Concluded on page 10)

The Elimination of Hypo from Photographic Images*

By J. I. CRABTREE, G. T. EATON, and L. E. MUEHLER

It is very difficult, if not impossible, to remove the last traces of hypo from photographic papers by any known procedure of washing. The sulfur in the residual hypo ultimately, and especially under abnormal conditions of temperature and humidity, combines with the silver image to form yellowish brown silver sulfide. This phenomenon is known as sulfiding or "fading" of the image. The various factors which affect the rate of fading of images and the washing out of hypo from films and papers are outlined.

Chemical methods of hypo elimination have been proposed from time to time but the majority of these have not been satisfactory because they tend to leave substances such as thionates in the photographic material, which are equally as difficult to wash out as hypo and which also tend to sulfide or fade the silver image. A new hypo eliminator is recommended consisting of two volatile chemicals, hydrogen peroxide and ammonia. This eliminator oxidizes the hypo to sodium sulfate, which is inert and soluble in water, while any excess eliminator evaporates on drying.

Two formulas and treatments are proposed: (1) Complete elimination of hypo for use by the professional, advanced amateur, and photofinisher who demand the highest standard of photographic quality in their prints. (2) Almost complete elimination of hypo (less than 0.01 milligram per square inch). Since the conditions to which prints will be subjected are rarely known in advance, use of the "complete elimination treatment" is advised in all cases.

In the processing of photographic developing-out materials such as gelatin silver emulsions coated on paper, film, or glass supports, if, after fixation, the hypo (sodium or ammonium thiosulfate) is not completely eliminated from the processed material by washing or other means, under suitable conditions of temperature and humidity during storage, the silver image will tend to "fade."

This fading is a result of the conversion of more or less of the silver image to silver sulfide by the sulfur present in the residual hypo, and is manifest by a change in hue of the image first to yellowish brown, then to yellow and, in most cases, the change is accompanied by a yellowing of the unexposed portions of the image. This yellowing of the highlights is a result either of (a) the use of an exhausted fixing bath, or (b) insufficient fixation whereby complex silver-sodium thiosulfates are retained and, under the proper conditions, decompose to give yellow silver sulfide.

In addition to attack of the silver image by hypo within the gelatin layer, many external agents are also effective, the most significant being hydrogen sulfide which is present in coal gas (illuminating gas). High humidity and temperature accelerate this reaction tremendously. Sulfur dioxide and other acid gases, in the absence of hypo, affect the silver image to a much less degree than hydrogen sulfide.

The rate at which a silver image fades depends upon many factors, including (1) the concentration of hypo (or tetrathionate) in the image layer, (2) the concentration of hydrogen sulfide and other acid gases in the atmosphere, (3) the grain size of the silver image, and (4) the temperature and humidity of storage.

Tests have shown that the degree of fading in a given time is roughly proportional to the concentration of hypo up to a certain limit, and a concentration as low as 0.005 milligram per square inch may cause fading with fine-grained images, especially in the case of papers.

An increase in the humidity, temperature, or both accelerates the rate of fading, and a combination of high humidity and high temperature, which conditions usually exist in tropical countries, is fatal to a photographic print containing hypo.

The presence of saline matter and acidic gases in the atmosphere also tends to increase the rate of fading.

Since fading or sulfiding of the image must necessarily take place initially at the surface of the image grains, fine-grained emulsions will tend to fade much more rapidly than coarser-grained emulsions and, in practice, chloride paper emulsions give images which are much more susceptible to fading than bromide emulsions. Similarly, a fine-grained positive transparency is much more susceptible to fading than an image on a high-speed negative emulsion.

Sodium thiosulfate tends to oxidize when exposed to the air with the formation of thionates and some sulfate. Certain recommended hypo eliminators oxidize hypo to sodium tetrathionate but the presence of this compound (and probably other thionates) is harmful because tetrathionate causes sulfiding of silver images almost as readily as hypo.

During this investigation it was essential to use an accelerated fading test in order to obtain directly comparable results within a reasonable time. Crabtree and Ross[1] have recommended the storage of test strips in a sealed glass container over water stored at a temperature of approximately 110° F. In the present investigation these storage conditions were maintained, the strips (negatives and prints) being suspended on glass rods in sealed glass containers as shown in Figure 1.

The Estimation of Hypo in Photographic Materials

A fallacy of the majority of investigations on hypo elimination has been the attempted estimation of the residual hypo by measurement of the hypo contained in the wash water. Testing solutions usually employed for this purpose are alkaline permanganate, iodine-azide, and mercuric chloride. These methods give a fairly accurate measure of the effect of washing upon "readily diffusible hypo" but they give no indication of the quantity of hypo retained by the photographic material.

In the case of images on glass or film, the hypo is usually removed quite readily by washing but, in the case of paper prints, it is extremely difficult, if not impossible, to remove all traces of hypo by washing alone. Apparently the thiosulfate ion is tenaciously held by the paper fibers and the baryta coating. A quantitative determination of the residual hypo in the photographic materials themselves is therefore necessary.

In 1908, Lumière and Seyewetz[2] recommended the use of silver nitrate as a spot test on prints and, again in 1935, Weyde[3] suggested the treatment of prints with silver nitrate to determine the hypo concentration but no details of a quantitative standardization were given.

In the present investigation, the silver nitrate test was standardized in such a manner that the transmission density of a print bathed in silver nitrate was proportional to the quantity of hypo contained in the print and quantities as low as 0.005 milligram of hypo per square inch were determined successfully. The data obtained were also confirmed by a quantitative determination of the reducible sulfur in the paper.[4] With this method as a tool, a much more direct comparison of the effectiveness of many suggested "hypo eliminators" was possible.

With the usual permanganate test which consists in allowing the surplus water from a washed single-weight print to drain into an alkaline solution of potassium permanganate,* a zero test is obtained when the silver nitrate test indicates the presence of about 0.2 milligram of hypo per square inch, a quantity which is capable of producing an objectionable degree of fading.

To determine the hypo in film, the mercuric chloride-potassium bromide test recommended by Crabtree and Ross[5] was used. A square inch of the material is placed in 10 cubic centimeters of the reagent and, after 15 minutes, the turbidity is compared with the turbidity produced in a series of standard solutions. This test accurately measures quantities of hypo in films as low as 0.005 milligram per square inch.

The mercuric chloride reagent was applied to prints but found incapable of reacting with all of the hypo in the sample. Since only the hypo which diffuses out of the film or print contributes to the opalescence, the test measures only the "readily diffusible" hypo, whereas in the silver nitrate test, the silver nitrate reacts with all of the hypo within the film or print. Comparison of the results obtained with the mercuric chloride and the standardized silver nitrate test with prints is given in Table I.

Fig. 1. Apparatus for accelerated fading tests.

TABLE I

Comparison of Mercuric Chloride and Silver Nitrate Test With Photographic Prints

Washed Prints (Minutes)		*Hypo Content (Mg. per Sq. In.)*	
Single-Weight	*Double-Weight*	*Mercuric Chloride*	*Silver Nitrate*
15		0.004	0.073
30		0.01	0.042
60		Trace	0.020
	15	0.02	>0.320
	30	0.01	0.173
	60	Trace	0.134

The Elimination of Hypo by Washing

The washing of photographic materials has always been accepted as a necessary operation but the importance of removing the last traces of hypo has often been underestimated.

Negatives. For washing it is always preferable to use running water in a system such that an "ideal stream" prevails, that is, a sufficient volume of water passes over the surface of the material so that it removes the hypo from the surface of the emulsion faster than the hypo diffuses out. When washing in a tray in still water, the water must be changed often and the negatives agitated continually. Under ideal conditions of water renewal, the most important factors which affect the rate of washing of films are: (1) The temperature of the wash water, and (2) the composition of the fixing bath.

The curves in Figure 2 illustrate the effect of the temperature of the wash water on the rate of elimination of hypo from Eastman Verichrome film. The films were washed under "ideal" conditions of water flow and it is seen that a change in temperature from 40° to 65° F. increases the quantity of hypo removed in a given time of washing by about 33 per cent, whereas increasing the

* Communication No. 780 from the Kodak Research Laboratories, Rochester, N. Y. Presented at the Sixth Annual Convention of the Photographic Society of America, October 26, 1940.

* Tests made with Kodak HT-1a Hypo Test Solution.

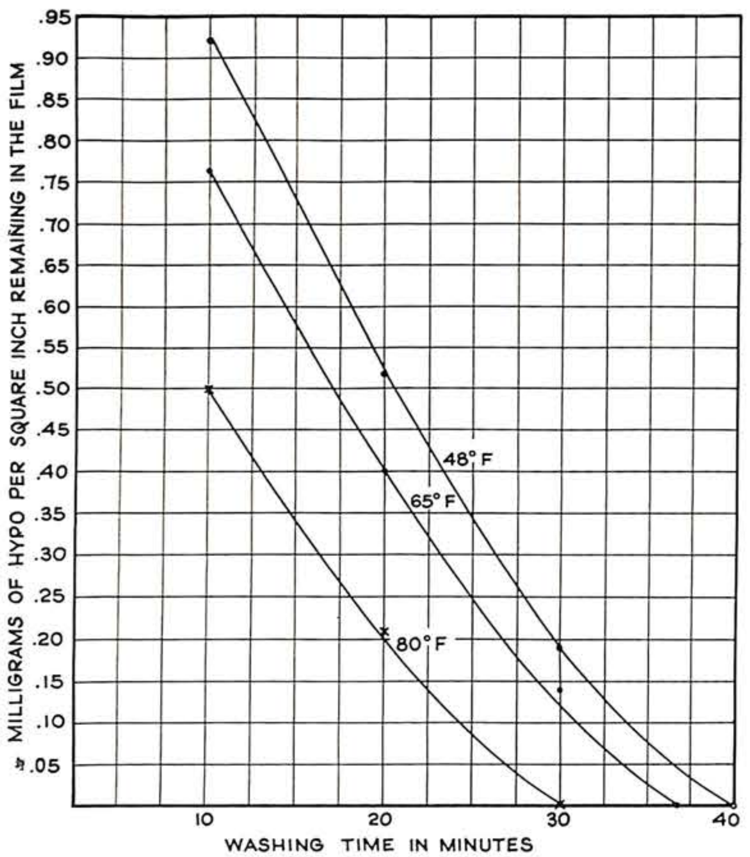


Fig. 2. Effect of wash water temperature on rate of hypo elimination from Eastman Verichrome Film.

temperature from 65° to 80° F. almost doubles the quantity of hypo removed. A temperature of 60° to 70° F. is recommended in view of the danger of swelling and softening at higher temperatures.

The hypo was also more readily washed from film which had been fixed in a nonhardening fixing bath than from film fixed in a potassium alum fixing bath. The use of a chrome alum fixing bath resulted in washing times somewhat less than those for potassium alum-hardened negatives.

Prints. Thorough washing is much more important in the case of prints than with negatives because fine-grained paper emulsions fade much more readily and, in some cases, in the presence of as small a quantity of hypo as 0.002 milligram per square inch. Not only is the image more susceptible to fading but relatively high concentrations of hypo are usually retained in the print. This retention of hypo is due to the presence of the paper fibers and the baryta coating and, since, even with extremely long times of washing with an " ideal stream of pure water," traces of hypo are retained in prints (especially with double-weight stock), it is apparent that the thiosulfate ion is probably mordanted or adsorbed to the fibers and baryta.

As in the case of negatives and assuming an " ideal stream " for washing, the two most important factors to be considered in the elimination of hypo from prints are: (1) the temperature of the wash water, and (2) the composition of the fixing bath.

In 1908, Lumière and Seyewetz[6] and in 1910, Hauberrisser[7] recommended the use of elevated temperatures during washing but, to date, no extensive practical application has been made of the suggestion. The curves in Figure 3 show the effect of the temperature of the wash water on the rate of elimination of hypo from single- and double-weight prints.

Single- and double-weight papers were washed for 20 hours, but the curves indicate that a maximum elimination is approached after 1 or 2 hours. The very great effect of temperature of the wash water is evident for the shorter washing times but is not so great for the longer times of washing. Washing for as long as 20 hours did not eliminate the last traces of hypo in either single- or double-weight papers. With extended washing, the rate of elimination tends to approach zero. The quantities of hypo retained after prolonged washing are sufficient to cause fading under certain storage conditions. It is evident, therefore, that use of a hypo eliminator is a necessity if the highest degree of permanence is desired.

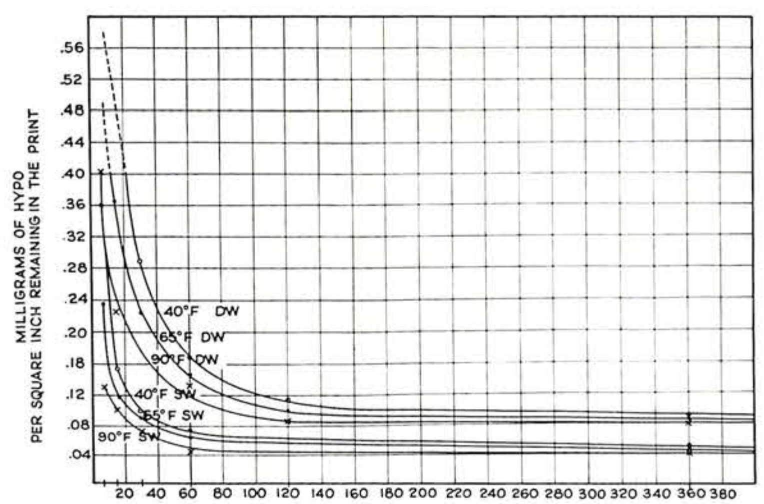


Fig. 3. Effect of temperature of wash water on rate of elimination of hypo from single- and double-weight prints.

The prints shown in Figure 4 were washed for times sufficient to leave the designated quantities of hypo in them and were then stored under the accelerated fading conditions previously described. They illustrate the effect of increasing hypo concentration on the degree of sulfiding or fading of the image and emphasize the necessity for the complete elimination of hypo from papers coated with fine-grained chloride emulsions.

0.250 mg. HYPO per sq. in. | 0.100 mg. HYPO per sq. in. | 0.07 mg. HYPO per sq. in. | UNTREATED

Fig. 4

Hypo Eliminators

The term " hypo eliminator " was first used by Hart[8] to indicate a solution which was capable of oxidation of thiosulfate to neutral sulfate. Oxidizing agents only were known as eliminators but the term acquired general use and is now applied to any solution or chemical that either oxidizes the hypo or assists in its elimination.

Many chemical treatments have been proposed to assist in the elimination of hypo or to make photographic prints permanent. Some of these may be listed as follows: Alum (1855); hypochlorous acid (1864); hydrogen peroxide (1866); sodium hypochlorite (1866); ammonium carbonate (1866); iodine (1872); zinc hypochlorite (1881), known as Flandreau's eliminator; ammonium persulfate (1899); potassium percarbonate (1901); alkaline perborates (1903); potassium permanganate (1904); chloramine T (1922); alkali carbonate or phosphate (1923); dilute caustic soda (1925); peroxide and ammonia (1931); and 1 per cent sodium carbonate (1935).* None of the suggested treatments has been generally accepted nor has any stood the test of time. It has been shown that none of these recommended treatments, even when used following careful washing, was effective enough to eliminate the hypo completely. In several instances increased concentration of the constituents successfully oxidized the hypo but to the detriment of the silver image.

Two general types were found to be particularly effective, namely (a) alkalies, and (b) oxidizing agents such as hydrogen peroxide-ammonia solutions.

Alkalies. Norton and Crabtree,† working with paper prints, recommended the use of dilute sodium carbonate solutions immediately after the fixation process and previous to washing. However, in view of the danger of precipitation of alumina with fixing baths containing alum, it is considered desirable to wash negatives or prints before the alkali treatment.

(1) Negatives. Various alkalies were found to assist in the elimination of hypo from negatives but they were not equally effective. A quantity of film was normally processed and washed for 8 minutes at 65° F. in running water, samples then being treated in distilled water, ammonium hydroxide, Kodalk, sodium hydroxide, and sodium carbonate solutions (0.3%) for 2 minutes. These samples were washed for 2 minutes, dried, and analyzed by the mercuric chloride method which indicated the following hypo contents in milligrams per square inch:

Untreated	>0.06	mg. per sq. in.
Distilled water	0.02	" " " "
Ammonium hydroxide (0.3%) pH = 10.40	Nil	" " " "
Kodalk (0.3%) pH = 9.90	0.01	" " " "
Kodalk (0.3%) pH adjusted to 10.40	0.005	" " " "
Sodium hydroxide (0.3%) pH = 11.57	0.01	" " " "
Sodium hydroxide (0.3%) pH adjusted to 10.40	0.01	" " " "
Sodium carbonate (0.3%) pH = 10.48	0.005	" " " "

Ammonium hydroxide was the most effective alkali and it also had the least effect on the physical properties of the emulsion. In most instances, regardless of the alkali, the time required to wash out the hypo completely was reduced by more than 50 per cent.

(2) Prints. An extensive study of the use of alkalies with respect to the elimination of hypo from prints indicated that ammonia was the most effective alkali. Sodium metasilicate, sodium hydroxide, and ammonia at concentrations of 0.08 Molar ‡ caused the complete elimination of hypo from prints which had been washed in an " ideal " stream of water for 15 minutes at 65° to 70° F., but the hydroxide and metasilicate produced severe physical defects in the print. Ammonia could be used effectively at room temperature and did not damage the prints. However, the time of 45 minutes required for treatment was excessive.

Peroxide-Ammonia

(1) Negatives. The use of hypo eliminators, other than alkalies, is not usually required in the processing of negative materials. However, the hydrogen peroxide-ammonia eliminator recommended below for prints is applicable to film emulsions also but must be used in lower concentrations (diluted 1:10) because of the tendency to soften and blister the emulsion.

(2) Prints. The outstanding fault with the majority of oxidizing agents proposed for hypo elimination is their acid character or their need for use in an acid medium. An alkaline peroxide solution, on the other hand, is a very effective oxidizing agent for sodium thiosulfate and does not attack the silver image even in quite high concentrations.

Hydrogen peroxide itself was recommended as early as 1866 by Smith[9] to be used in a dilution of 1:1000 for a minute or two. He later suggested that the acid in the peroxide be neutralized with soda. About the same time Spiller[10] reported an attempted use of a mixture of hydrogen peroxide with ammonia but declared that such a mixture was unsatisfactory because the two constituents " mutually decomposed." Subsequent workers reported that hydrogen peroxide itself did not oxidize all of the hypo to sulfate but produced some thionates. This is actually the case but alkaline peroxide having a suitable pH value oxidizes the thiosulfate completely to sulfate.

In 1931, a note in *Das Lichtbild*[11] mentioned the use of hydrogen peroxide as a hypo eliminator. Here, ammonia was added dropwise until the solution just

* A chronological bibliography is given in the appendix.

† Eastman Kodak Laboratories, July, 1923, unpublished results.

‡ In grams per liter: sodium metasilicate (crystal) 17 grams, sodium hydroxide, 3.2 grams, ammonia (28%), 5 cubic centimeters.

smelled of ammonia, an adjustment which corresponds to that of Smith who used soda to neutralize the acid in the peroxide. It is evident, then, that the previous use of hydrogen peroxide was concerned with neutral hydrogen peroxide.

Experiments in these laboratories have shown that definitely alkaline peroxide solutions will oxidize sodium thiosulfate completely to sulfate and the study of alkalies in hypo elimination has shown that ammonia is the most suitable alkali for this purpose. It has the additional advantage that it is volatile, so that, after treatment, the only residue is a trace of sodium and ammonium sulfates. An investigation was therefore made of ammonia-peroxide solutions to determine their activity in the elimination of hypo from prints.

At the outset, mixtures of peroxide with increasing concentrations of ammonia were prepared to determine the pH range of the solution over which effective oxidation of hypo was attained (see Table II).

TABLE II

CHANGE IN pH WITH INCREASED AMMONIA CONCENTRATION

Composition of Solution (Cc. per Liter)			*pH*
H_2O_2 (3%)	*Water*	*Ammonia (28%)*	*Glass Electrode*
500	500	...	3.7
500	500	0.6 (Das Lichtbild)	9.0
500	500	2.0 (Marked odor)	9.3
500	500	10.0	9.8
250	750	10.0	9.95
125	875	10.0	10.15
...	1000	10.0	10.75

Solutions having a pH value lower than 9.8 were not entirely satisfactory as hypo eliminators because of their low activity. The three solutions containing 500, 250, and 125 cubic centimeters of 3 per cent peroxide per liter with 10 cubic centimeters of 28 per cent ammonia in each were compared throughout the study. Dilutions with water of any of these solutions produced mixtures which would not efficiently remove the last traces of sodium thiosulfate. Table III illustrates typical results obtained by treatment in these solutions for different times after increasing times of washing.

It is apparent from Table III that, if double-weight prints are washed for 20 minutes and then bathed for 10 minutes in the eliminator solution, the hypo is completely eliminated from the prints in the case of all three of the above solutions containing varying quantities of peroxide. The disadvantage of the 125/10 peroxide-ammonia mixture is its shorter exhaustion life as compared with the 500/10 mixture. For single-weight prints, a shorter wash will suffice. All prints must be washed for at least 5 to 10 minutes after the eliminator treatment.

A duplicate set of the prints shown in Figure 4 was treated in a hydrogen peroxide solution for 5 minutes, washed for 5 minutes, and then subjected to the accelerated fading test at the same time as the prints which were not treated in the eliminator solution. The effect of the peroxide-ammonia eliminator in preventing fading is illustrated in Figure 5.

TABLE III

THE ELIMINATION OF HYPO FROM DOUBLE-WEIGHT PRINTS WITH PEROXIDE-AMMONIA

Peroxide-Ammonia (Cc. per Liter)	*Time of Washing (Min.)*	*Time of Treatment (Min.)*	*Hypo Concentration (Mg. per Sq. In.)*
500 + 10	10	5	0.040
(Peroxide) (Ammonia)		10	0.006
3% 28%		15	Nil
	20	5	0.004
		10	Nil
	30	5	0.004
		10	Nil
250 + 10	10	5	0.038
(Peroxide) (Ammonia)		10	0.007
3% 28%		15	Nil
	20	5	0.008
		10	Nil
	30	5	0.007
		10	Nil
125 + 10	10	5	0.055
(Peroxide) (Ammonia)		10	0.007
3% 28%		15	Nil
	20	5	0.006
		10	Nil
	30	5	0.005
		10	Nil

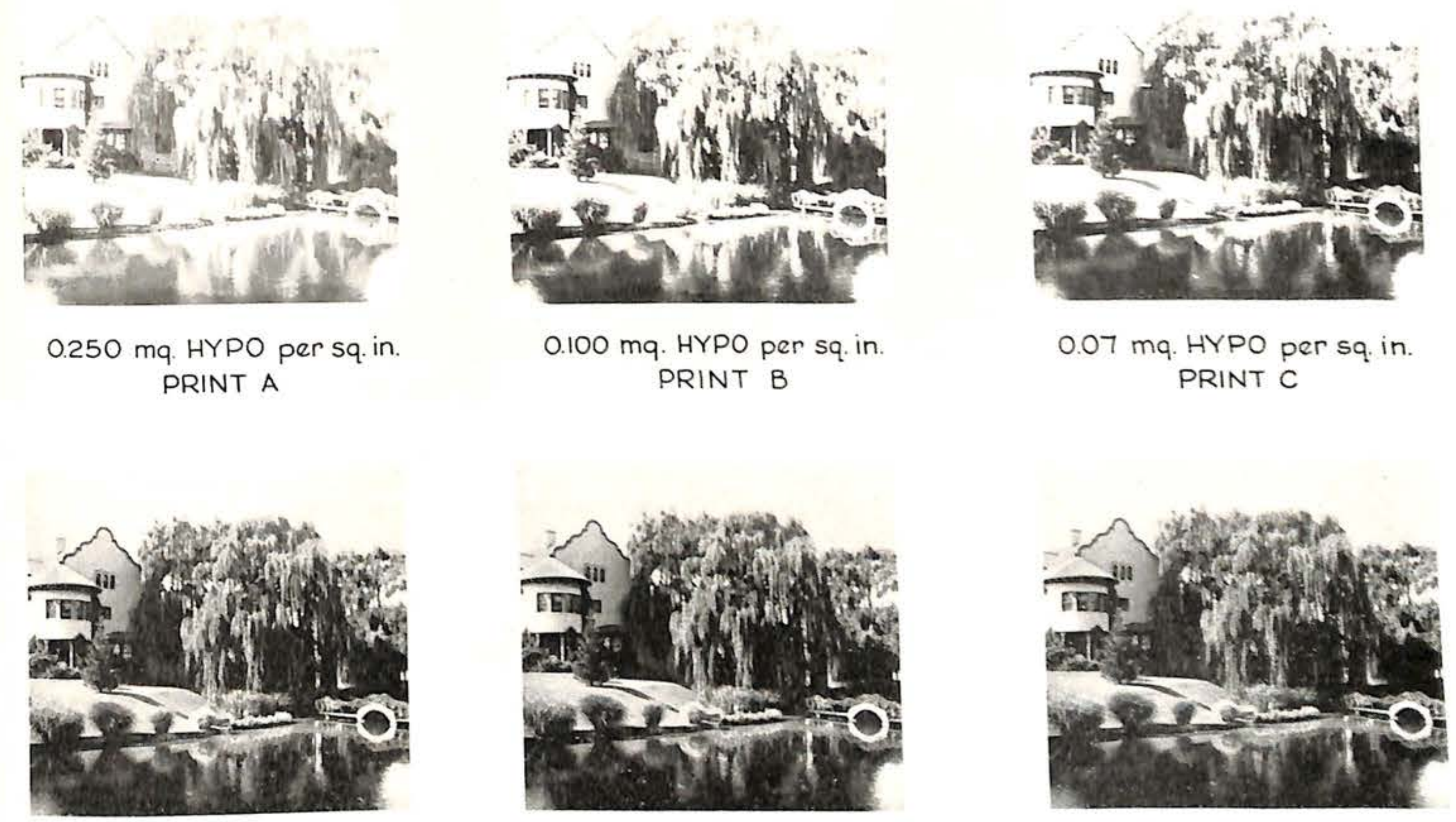
An extensive study of the application of these solutions in the photographic trade was made with special attention to exhaustion life of the solutions, and to any possible deleterious effects in commercial processing. The specific application is dependent upon the use intended. At the outset, since it is never possible to predict the conditions to which a print may be subjected, every photographer must eliminate the hypo completely from prints and negatives, even if this may require some slight modification of his processing machine or the method of working.

RELATION BETWEEN THE THEORETICAL AND PRACTICAL QUANTITIES OF HYPO REQUIRED TO PRODUCE FADING

It is of interest to study the relationship between the theoretical quantity of sodium thiosulfate required to convert any given silver image to silver sulfide and the quantities actually required to produce fading under accelerated conditions in practice.

The "photometric equivalent"[12] may be defined as the number of grams of silver in a 100 square centimeter area of emulsion which are necessary to give a density of 1.00. Its magnitude varies with the exposure, the degree of development, and the grain size of the emulsion, ranging from approximately 0.005 to 0.035, depending upon the type of the emulsion.

Hickman and Spencer[13] calculated the quantity of thiosulfate required to react with the silver in an image having a density of 0.10 and made the assumption that only one-tenth of the silver need be sulfided to produce just visible fading, which seems reasonable. The reaction may be expressed by the equation—



0.250 mg. HYPO per sq. in. PRINT A — 0.100 mg. HYPO per sq. in. PRINT B — 0.07 mg. HYPO per sq. in. PRINT C

After Treatment with Eliminator PRINT A — After Treatment with Eliminator PRINT B — After Treatment with Eliminator PRINT C

Fig. 5

$$2\,Ag^{+} + S_2O_3^{=} \longrightarrow Ag_2S + SO_3^{=}$$

Silver — Thiosulfate ion — Silver Sulfide

To express the quantity of thiosulfate in milligrams per square inch which is required to fade an image of density 0.10, the following formula was employed:

$$\text{Photometric Equivalent} \times \frac{\text{Molecular Weight of Sodium Thiosulfate}}{2 \times \text{Atomic Weight of Silver}} \times \text{Conversion Factor Metric to Avoir.} \times 10\% \times 0.1$$

$$\| $$

$$\text{Photometric Equivalent} \times \frac{248}{215} \times \frac{6.45 \times 0.1 \times 0.1}{100 \times 1000}$$

The sulfiding reaction first occurs visibly in the low densities having a value of approximately 0.10. The photometric equivalents at low densities are given in Table IV and also the theoretical quantity of thiosulfate required to produce fading at a density of 0.10. Included in the same table are limiting concentrations of hypo above which fading occurred under the conditions of the accelerated fading test.

In general, the faded images with the intermediate and high-speed materials possessed a purplish-black coloration not greatly different in appearance from the original and often of similar printing density. The images of motion picture positive emulsions became more yellowish-brown than those of the high-speed materials but only when the hypo content was in considerable excess of 0.07 milligram per square inch. With the finest-grained materials, a definite yellowing occurred at concentrations of thiosulfate greater than 0.02 milligram per square inch.

A comparison of the theoretical values given in Table IV with the quantities determined by experiment reveals that (1) with chloride paper emulsions the hypo content should not exceed 0.002 to 0.005 milligrams per square inch or 0.02 milligrams per square inch with chlorobromide emulsions; (2) with film emulsions, in general, more hypo is allowable than the calculated theoretical value, for example, (a) fine-grain materials 2 to 3 times, and (b) with negative materials, 4 to 9 times. This indicates that when a safety factor of 10 is assumed in the determination of the quantities of hypo required to fade images, in general, the formula is applicable only to paper emulsions. With film emulsions, it is apparently necessary to convert from 25 to 50 per cent of the total mass of the image to silver sulfide before the image color changes appreciably.

All of the types of emulsions mentioned are readily washed to the degree indicated in Table IV and, in good commercial practice, are usually washed to concentrations well below those given. Process, motion picture positive, and fine-grain emulsions, for example, often contain as little as 0.005 milligram per square inch, as determined by the Crabtree-Ross method. This method

TABLE IV

Material	Density at Which Photometric Equivalent Was Measured	Photometric Equivalent at Indicated Density	Calculated Quantity of Hypo (Mg. per Sq. In.) Required to Cause Fading at Density of 0.1	Concentration of Hypo Required in Practice* (Mg. per Sq. In.)
Chloride paper emulsions	....	....	0.005†	0.002–0.005
Chlorobromide paper emulsion‡	0.25	0.0087	0.007	0.02
	0.08	0.009	0.007	
Fine-grain Lantern Slide[15]	1.00	0.005	0.008	0.02
Fine-grain emulsion	0.47	0.0108	0.008	
Process emulsion[14]	0.13	0.0153	0.011	0.07
Process emulsion[14]	0.09	0.0235	0.018	
Commercial emulsion[14]	0.13	0.0226	0.017	0.14
	0.56	0.0228	0.017	

* These figures represent average values for the types of materials mentioned.
† Chloride emulsions are more fine-grained than chlorobromide emulsions and the photometric equivalent is probably as low as 0.005.
‡ Unpublished results—S. E. Sheppard and A. Ballard, Kodak Research Laboratories.

of analysis has been adopted by the National Bureau of Standards.[16]

Practical Recommendations

With negatives and transparencies or, in general, any gelatin silver image on a waterproof support, if, during washing an adequate renewal of the wash water prevails, the hypo can be removed completely by water alone in a reasonable time at a temperature of 60° to 70° F. without the use of a hypo eliminator.

If it is necessary to speed up the processing by using a shorter washing time, a supplementary alkaline bath may be used. After the negatives have been washed for 10 minutes, they should be bathed in an 0.3 per cent solution of ammonium hydroxide (100 cubic centimeters of 28 per cent ammonia per liter) for 3 minutes and then washed for 2 or 3 minutes.

The rate of washing is also hastened if either a chrome alum or nonhardening fixing bath is employed.

With photographic prints, washing is hastened by using water at around 70° F., but it is never possible to remove the hypo completely by merely washing so that the print will not subsequently fade if subjected to abnormal conditions of temperature and humidity. The use of the following peroxide-ammonia eliminator is necessary to insure permanency:

KODAK HE-1

Hypo Eliminator Solution for Professional and Amateur Use

	Avoirdupois	Metric
Water	16 ounces	500.0 cc.
Hydrogen Peroxide (3% solution)	4 fluid oz.	125.0 cc.
Kodak Ammonia (3% solution)	3¼ fluid oz.	100.0 cc.
Water to make	32 ounces	1.0 liter

To make 3 per cent ammonia, dilute 1 part of 28 per cent ammonia with 9 parts of water.

Directions for Use: Wash the prints for about 30 minutes at 65° to 70° F.* in running water which flows rapidly enough to replace the water in the vessel (tray or tank) completely once every 5 minutes. Then immerse each print about 6 minutes at 70° F. in the Hypo Eliminator Solution (Kodak HE-1), and finally wash about 10 minutes before drying.

Life of Kodak HE-1 Solution: About fifty 8-inch x 10-inch prints or their equivalent per gallon (4 liters).

Test for Hypo: Process with the batch of prints, an unexposed *white* sheet of photographic paper (same weight and size as majority of prints in batch). After the final wash, cut off a strip of this sheet and immerse it in a 1 per cent silver nitrate solution for about 3 minutes; then rinse in water and compare, *while wet*, in subdued daylight or artificial light, with the *wet, untreated portion*. If the hypo has been completely removed, no color difference should be observed. A yellow-brown tint indicates the presence of hypo.† *Caution:* Silver nitrate solution stains the skin black; avoid direct contact with the solution.

KODAK HE-2

Hypo Eliminator Solution for Commercial Photofinishing Use

	Avoirdupois	Metric
Water	10 ounces	300.0 cc.
Hydrogen Peroxide (3% solution)	16 ounces	500.0 cc.
Kodak Ammonia (3% solution)	3¼ ounces	100.0 cc.
Water to make	32 ounces	1.0 liter

To make 3 per cent ammonia, dilute 1 part of 28 per cent ammonia with nine parts of water.

Directions for Use: Wash the prints about 15 minutes at 65° to 70° F.* in running water which flows rapidly enough to replace the water in the washing vessel (tray or tank) completely once every 5 minutes. Then immerse each print for about 5 minutes in the Hypo Eliminator Solution (Kodak HE-2), and finally wash about 10 minutes before drying.

When using Pako Print machine (or similar equipment), replace the water in the second wash tank with the Hypo Eliminator Solution (Kodak HE-2), and process the prints as usual.

Life of Kodak HE-2 Solution: About eighty 8-inch x 10-inch prints or their equivalent per gallon (4 liters).

Test for Hypo: Use the same test as recommended for use with Kodak HE-1 Solution.

* For lower temperatures, increase the washing time. Double the washing time should be used when double-weight prints are treated.

† A positive test with silver nitrate may also be obtained in the absence of hypo, if hydrogen sulfide or wood extracts are present in the water supply.

Occasional Effects When Using the Peroxide-Ammonia Treatments HE-1 and HE-2

1. A slight change in tone. This tone change is not as great as that produced by ferrotyping and, therefore, is considered to be negligible for glossy papers. When it is desired to prevent the slight tone change on professional papers, 15 grains of potassium bromide should be added to each quart (1 gram per liter) of the Kodak HE-1 bath.

2. A slight yellowing of the whites (undetectable on buff papers). To minimize this effect, the prints should be bathed in either a 1% acetic acid solution or a 1% sodium sulfite solution for about 2 minutes immediately after treatment in HE-1 or HE-2 and prior to the final wash.

3. If the prints feel too slippery after the eliminator treatment, they should be immersed for 1 minute in a 1% solution of acetic acid and then washed for 3 or 4 minutes.

4. A slight tendency for treated prints to stick to a hot belt dryer. To prevent this, the prints should be bathed prior to drying, for 3 to 5 minutes in a 50% denatured alcohol solution. A 2% potassium alum solution is effective also but requires a rinse of several minutes in water after the treatment.

5. An occasional tendency for treated glossy prints to ride the squeegee roll of the ferrotype dryer (especially prints which have been accidentally fed into the machine emulsion side up), or to stick to the chromium drum itself. To overcome these difficulties, the prints should be bathed for 2 minutes in a 50% denatured alcohol solution just prior to ferrotyping.

6. While cleanliness of the drum surface is essential for the satisfactory ferrotyping of all prints, it is especially important as a sticking preventative in the case of peroxide-ammonia treated prints. Excessive drum temperatures should also be avoided.

The above treatment will insure the absence of fading from internal fading agents. However, a hypo-free image will be attacked by hydrogen sulfide which is present in the products of combustion of coal gas and in the atmosphere of industrial regions. This external fading is accelerated by the presence of acidic gases and by high temperature and high humidity.

The use of water-miscible (paste) adhesives for mounting also contributes to fading, since such adhesives are usually hygroscopic and the resulting moist condition of the print is favorable to more rapid chemical reaction.

Fading due to external agents may be minimized by (1) the use of a waterproofing lacquer over the print surface, (2) the use of Dry Mounting Tissue, and (3) bathing the print in a solution of a salt of a noble metal, such as gold chloride (with sodium thiocyanate), when the metal ion displaces the outer layer of the silver grains, usually with a negligible change in image color. A suitable formula consists of gold chloride, 0.1 gram; sodium thiocyanate, 10 grams; dissolved in 1 liter of water.

It is essential that the solution be prepared just before use and in the following manner: Add 10 cubic centimeters of a 1 per cent gold solution to a 1-liter vessel and dilute to approximately 700 cubic centimeters. Dissolve the thiocyanate in a small volume of distilled water and add slowly to the gold solution with continuous agitation. Then make up to 1 liter with water.

Bathe either the freshly washed or dried prints for 8 minutes at 70° to 75° F. with agitation or until a just perceptible change in tone occurs and then wash for 5 minutes before drying. The life of the bath if used immediately is approximately thirty 8-inch x 10-inch prints per gallon of solution.

The gold treatment also stabilizes the image against fading by hypo. It is not quite as effective, however, as the peroxide-ammonia treatment and has the disadvantage that the color of the image is changed slightly.

With respect to fading by hydrogen sulfide, lacquering the print surface is helpful but not as effective as the gold treatment. Dry mounting in combination with a lacquer is surprisingly effective from which it is apparent that the hydrogen sulfide attacks the image appreciably from the rear through the paper stock as well as at the surface.

A combination of these procedures, namely (1) use of the peroxide-ammonia hypo eliminator, (2) treatment with the gold solution, (3) the use of Dry Mounting Tissue, and (4) lacquering of the print surface, will insure maximum permanency of the gelatin silver print image. Conversion of the silver image to silver sulfide by sulfide toning in the usual manner, or to silver selenide or telluride, will also insure maximum permanency, although such treatments change the color of the image.

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References

1. Crabtree, J. I., and Ross, J. F.: A Method of Testing for the Presence of Thiosulfate in Motion Picture Film. J. Soc. Mot. Pict. Eng., **14**, 419–426, 1930.
2. Lumière, A. & L., and Seyewetz, A.: Ammonium Thiosulfate as a Fixing Bath. B. J. Phot., **55**, 417–418, 1908.
3. Weyde, E.: On the Possibility of Improving the Permanence of Photographic Prints. Photo Woche, **25**, 474, 1935. See also B. J. Phot., **82**, 376, 1935, and Veröff. wiss. Zentral-Lab. phot. Abt. Agfa V, 181-186, 1937.
4. "Reducible Sulfur in Paper." Paper Trade Journal, Technical Association, Section **108**, 24–25, March 2, 1939.
5. Crabtree, J. I., and Ross, J. F.: A Method of Testing for the Presence of Thiosulfate in Motion Picture Film. J. Soc. Mot. Pict. Eng., **14**, 419-426, 1930.
6. Lumière, A. & L., and Seyewetz, A.: Entfernung des fixiernatrons durch Waschen mit Wasser. Eder's Jahrbuch, 1908, pp. 505–6.
7. Hauberrisser, G.: Über das Entfernen von Fixiernatron aus photographischen Schlichten durch Auswassern bei Hoherer Temperatur. Phot. Rund., **24**, 91, 1910.
8. Hart, F. W.: Early History of Hypo Eliminators. B. J. Phot., **35**, 151, 1888.

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Problems Facing the Professional Photographer

By HILLARY G. BAILEY, F.R.P.S. *

[Editor's Note—*The views expressed in this article are those of Mr. Bailey and present one man's viewpoint. If you disagree we would be interested in hearing your opinion.*]

It is not uncommon to hear an ambitious and skilled amateur photographer express an ardent desire to enter the field of professional photography. He has reason to support his ambition, for without doubt the spectacularly successful photographers of recent years have graduated, as it were, from the ranks of the struggling amateurs. When this fact is remembered repeatedly, it becomes a conclusive argument to support the wishful thinking that imagines professional photography to be a means of eating from time to time and sleeping occasionally under a roof.

It is well, therefore, that caution should be voiced for whatever good caution can be. There are problems which face the professional photographer today of no small import. Briefly, these problems fall into five groups.

In the first place, professional profits are far below the calculations imagined in amateur dark rooms. It is not the profit made on a particular job or print that tells the final story; it is the time out between jobs and print making that causes all the trouble and discounts the profits. Amateurs are nearly always better cost accountants than professional photographers, but amateurs nearly always calculate on more volume than can be found. After all, there are about so many pay pictures to be made each year, and although that number is increasing, the rate of increase is seldom affected by any one man's enthusiasm and belief in his own product. Sad words, but true.

Furthermore, the price per print for photographs has decreased discouragingly within the last ten years. That means production must be increased several times to provide equal profits; and increased production demands more mechanical devices and less hand work, a fact that is very unpopular to the present philosophers of economic policies.

There will be those who believe what they read in the papers and who will think my statements are not as encouraging as they should be. They will call me pessimistic and a crepe hanger. Unfortunately, I dare not provide actual figures and names to support my statements, but I can point to one very famous illustration firm which will admit, if you insist, that the spectacular photographer whom they advertise is profitable only as a piece of window dressing. Isn't that a shock? They admit that he contributes nothing in dollars and cents profit to their firm. He is maintained like any ordinary commercial "loss leader" for the prestige which his work gives to the less glamourous commercial photography done by other photographers of the same firm.

Not the least of the professional's problems is the amateur himself. Of course, when the professional resents the amateur because the latter can often talk a mystifying technical language, his resentment is not justified; but when he resents the amateur who horns in and makes snaps from the viewpoint already selected by the professional and charges a lower price for imitative results, then his resentment has basis for complaint. In such instances, he feels that food is being taken from his mouth by someone who earns the necessities of life by another merchandising program, and that they have no right to cheat on him in such a manner. Well, there is some justification to his thinking after all.

Perhaps, few photographers, if any, have been confronted by discussions of this problem more than I have within the last few years. I have represented a manufacturer who made film for both the amateur and professional; and it was my job, I guess, to spread sunshine from time to time among the professionals. Invariably, their chief complaint affecting their welfare was against the chiseling amateur. Unfortunately, it has almost become an obsession with them. The stock answer which was usually offered to placate them implied that the few pictures which the amateur makes create a desire for professionally made pictures. But I never fully believed the stock answer when I offered it and am not fully convinced yet.

The next problem is competitive price cutting and underpricing, but all businesses face this situation; so discussion here is unnecessary.

Then, there is government regulation. While, perhaps, intended as a blessing, this factor imposes unimaginable hardships. It is wise to allocate from one-fifth to one-fourth of the gross business to pay governmental cuts.

The last problem is one few amateurs have had opportunity to visualize from all sides. They have been accustomed to the plaudits and praises of their friends who really are working the poor saps for free or cheap pictures to such an extent that they are not aware of the annoyances and losses which come from satisfying customers who are not primarily on the make. You may think you are good by the testimony of your friends to whom you are actually or virtually giving pictures, but when you start to charge for those pictures at prices

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Wild Animal Photography

By TAPPAN GREGORY *

In common usage, the term "wild" as applied to animals is all inclusive. Those captured in their natural habitat and confined in the zoos are wild animals. Those protected in preserves, refuges and parks are wild animals. Those living in their natural state, unaffected by human control or protection are wild animals. These latter are wild perhaps in a truer sense than the others. I do not mean that they are more ferocious or more furtive. The cottontail rabbit and the deer-mouse, living in my home woodlot, are wild, no less so, in the sense in which I use the term, than the mountain lion of the highlands of Mexico or the bull moose of New Brunswick or the timber wolf of the swamps of Louisiana. Animals in all of these categories make beautiful photographic subjects. And good pictures of any of them are works of art, worthy of painstaking attention.

My own interest has been directed for many years to the engrossing and stimulating sport of seeking photographs of mammals in their natural state. I am a hunter, substituting the camera for the rifle or shotgun as the medium through which to reduce the quarry to possession. All the thrills of the chase are present except the final killing. Wits must be matched, habits studied, care and patience cultivated and a certain amount of reserve of experience and skill stored up against unusual circumstance or incident.

And I have some advantages over the man with the firearm. My method knows no closed season, no bag limit, no posted land, and no mammal roaming at large is too small or too great to come within the range of lawful prey of the camera.

I like to follow the animals into far away hideouts in the wilderness. I like to spend an hour or so at the end of each working day hunting them in my own backyard. It is fun to track them down in the snow and no less interesting to seek them out in midsummer. Weather makes little difference. It may be hot or cold, raining, snowing or sunny, winter or summer, day or night. Always there is some form available and some method by which to record it photographically.

The subject itself determines to a large extent the method of approach. Big game animals may frequently be readily approached and pictured in the day time by one who will stalk carefully. Telephoto lenses naturally are of great assistance in this type of photography. I have never used a telephoto lens and therefore can do no more than refer to it in passing.

Sometimes natural cover may be availed of to good advantage. Often the construction of a simple blind is indicated, located at salt lick, stream or lake shore or close to a well-traveled runway. But the range of possibilities is never so broad as when the set camera is the weapon selected. It is so arranged that the subject takes its own picture by closing a break in an electric circuit. I have stood as close as two or three feet from my victim and watched him take his own picture and I have been almost two thousand miles away when the camera brought in its trophy.

Perhaps no method comprehends more of the thrills of the chase and gives greater satisfaction than that which I know as "shining". The Honorable George Shiras, III, was the pioneer in this field of photography. He led the way back in the '80's, and it was a combination of the inspiration of his beautiful early pictures of the white-tailed deer and of the sight of these graceful creatures at large in the north woods that inspired me to make my earliest efforts in emulation nearly thirty-five years ago. Our early experiments were so primitive that we appeared to be doomed to failure at the outset until the late Norman McClintock graciously initiated us into the intricacies of apparatus suitable for this fascinating hobby. In those days the photoflash bulb was unknown and the set camera hardly beyond the stage of trial and error.

We knew where the deer were accustomed to feed nightly throughout the summer. They came into the shallows at the head of an inland lake in the north woods and there spent many hours between dark and dawn satiating their appetites on a variety of succulent, nourishing edibles, sometimes browsing on the brush that lined the shore, sometimes pulling up lilypads by the roots, sometimes plunging their muzzles under water to partake of perhaps more delicate selections. They had become extensively nocturnal in habit, perhaps to some extent because of the presence of fishermen during the hours of daylight, perhaps because it was their natural inclination.

Ideal conditions required warm nights, still nights, nights that were dark with no moon and no bright northern lights to enable the deer to see the outline of our boat behind the dim light of our jacklight. The jack itself, in those days, was no elaborate electric torch with rheostat. Possibly with such a light we could approach in the moonlight and by judicious regulation avoid scaring the animals, yet turn upon them a glare of sufficient brilliance to preserve our incognito. What we used was an old kerosene carriage lamp, giving a dim, evenly distributed light, with no focal point.

The rest of our equipment was equally primitive. A soap box was made into a turntable through the medium of a broomstick on which it was hung. The top and bottom of the box were knocked out, the broomstick introduced through a hole in one side and socketed against the other side. The broomstick was then dropped

* Chicago, Ill.; Member Photographic Society of America.

down through a triangle formed by two spikes driven into the decking in the bow of our flat-bottomed skiff and pivoted smoothly on a nail fastened in the end of the broomstick and filed to a point, resting in an indentation in the top of a tobacco tin tacked to the bottom of the boat. We used the flat-bottomed skiff instead of a canoe as a general rule because of its greater steadiness. Still-paddling was always required, or perhaps it should be called fan-paddling, and speed was never a prerequisite. Our cameras were wrapped in some kind of water-proof cloth, fastened on either side of the broomstick on the inside of the turntable by means of tripod screws, and on the side of the soapbox which had become the top of the turntable the jacklight was wired against the possibility of its sliding into the lake in the event of untoward circumstance. Each camera was set to focus at twenty-five feet. The light for the picture was furnished by a charge of one-half ounce of magnesium flashpowder spread in an open container attached to a pistol and fired by hand. The powder was ignited by shooting into it a 22 cartridge from which the bullet had been extracted. When we set forth into the chosen feeding ground, the shutters were opened and the jack lighted. By this method, of course, we availed ourselves of the full light value of the burning flashpowder, but were handicapped by the necessity that all motion on the part of the deer or ourselves be eliminated save the steady drift of the boat toward the animal.

Now, of course, all this has been changed. The first move was to discharge the flash itself by means of an electric current and photographic squib and then came the improvement accomplished by the arranging of a pull-type cable release fastened to the bottom of the camera, wired to the shutter-arm, socketed in the powder container in such a way that the powder charge, made somewhat explosive by being contained in a waterproof cardboard box, supplied the energy when it burned, to operate the cable release and trip the shutter at 1/200th of a second.

Finally the use of powder, a dangerous medium, was abandoned in favor of the photoflash bulb synchronized with the shutter. The turntable was streamlined and mounted on ball bearings and electric torch and rheostat substituted for kerosene lantern.

Although I have never hunted deer with a rifle, it has always seemed to me that perhaps it is more difficult to approach to a distance of twenty-five feet and eliminate all those baleful influences that may so easily ruin a photograph than it is to hit a running deer at one hundred yards with a bullet from a high powered rifle.

I wish I were possessed of the necessary talent to describe the delights of this sport vividly enough to be really persuasive. I think I shall try anyway to tell you a typical tour of our favorite bay.

We are camped a mile or so away in order that we may disturb the deer as little as possible during the day when there must always be a certain amount of noisy activity in the neighborhood of our canvas home. We have watched the weather with anxious eye all day, knowing that there will be no moon, but apprehensive lest the water, heated by the bright sun, may generate mist if the temperature drops too far or too fast at sundown. This condition will cause a fogging of our lenses. The wind, too, is an element with which we must contend. If it blows into the bay there is no prospect of success. If it blows at all, it will be difficult to handle the boat in the absolute silence so necessary to the approach of these timid and wary ruminants. As the sun drops below the horizon and we note the dying of the wind while the twilight hush gradually spreads through the forest and the lake becomes quiet except for an occasional ripple caused by a rising fish or the eerie call of a distant loon, we breathe more easily and busy ourselves with the necessary preliminaries. The turntable is set up in the bow of the skiff, properly leveled off, the cameras are installed, the jacklight put in place, the flashgun cleaned and made ready and extra supplies of plates and powder stored in compartments built on the bow thwart.

At dusk we are on our way to the head of the lake. The bay is sheltered against vagrant breezes by the surrounding hills and partly enclosed within the protection of a rocky point. Behind this we draw up to await complete darkness. It also furnishes a refuge for rest between trips into the bay, to be availed of periodically, especially after the flash has been fired and all the feeding deer frightened into precipitate retirement. We must allow them to regain their courage or new diners to take their places before intruding again. A barred owl startles us with its unexpected scream from a branch overhead and in the distance the great horned owl mutters its melancholy note.

Finally the last vestiges of twilight have faded and with jack lighted and shutters open, we push around the point into the bay and there allow the skiff to drift while we listen for the sound of wading deer. Perhaps this time we may count four or five of them. Then we must determine our course with care, selecting the most desirable subject, at first exclusively by sound. We cannot see until we have approached close enough to catch the glow of his eye reflected in the light of the jack—nothing more. It is only when we are within fifty feet or so that his dim outline becomes visible. We must be careful not to pass another deer, which, left outside the influence of the jack, may be able to see us and give the alarm. Now, as we drift close to the outside limits of the required range, we must be keenly alert to make no sound and to be sure that the boat will not scrape upon hidden logs or branches. At length, at twenty-five feet, we are ready. Nothing interferes with a clear view of the deer. The background is satisfactory, but the pose is awkward. We must hold the skiff steady until the splendid antlered head comes up alert, eyes shining brightly as the animal gazes at this strange light, this unaccustomed moon-like apparition. The gun is quickly raised and the flash fired. The water flies in white spray as all nearby deer rush for the shelter of the woods.

Now we slip quietly away around our rocky point, but in fifteen or twenty minutes we are back again, guiding our craft once more toward the welcome sound of wading.

And so it goes until the first streaks of dawn make further shining out of the question. From the top of a nearby ridge an old timber wolf salutes us with his hollow-timbered hunting call as we push off for camp.

Photographic Advertising

By HOWARD C. COLTON *

The growth of interest in photography has brought many new materials into the field. Organizations in increasing numbers, are placing on the market products of dubious merit and very misleading claims are advanced in their advertising. The most widespread use of such tactics seems to be in fine grain developers but other areas are feeling the impact of such methods. The use of such products should be actively discouraged.

THE introduction of miniature cameras several years ago brought in its wake a rapidily enlarged following of photographers. For a short time the small camera was an adjunct to the standard professional equipment to be used for special types of work for which it was particularly suited. Then, rather suddenly, the number of " mini " users spread rapidly among amateur photographers and finally the general public became interested in the new fad.

The meteoric growth of business brought a number of worthwhile advances. The number and quality of rapid lenses increased sharply, the manufacturers improved emulsions in respect both to speed and to grain size and the number of pieces of precision apparatus available steadily mounted. During the last two years, however, there has been a rapid increase in the number of products of dubious merit and in photographic advertising claims which are, to say the least, exaggerated. As the field of new photographic recruits has grown, the number of products of questionable merit has developed apace. Unfortunate as this practice may be, it is simply a search for faddists who bite easily. If the same type of exaggerated claims were to be made in food and drug advertising, the advertisers would find themselves in trouble with the government in a very short time.

The distribution of so-called fine grain developers has seemed especially attractive to certain firms. Although it has been demonstrated many times that the most important factor in graininess is the emulsion chosen, fantastic claims continue to be advanced for the mass of bottled developers on the market. Claims for very small grain, tremendous film speeds and nearly infinite life are seen on every hand in advertising in the popular photographic magazines. The claims of fine grain are realized only when the emulsion is developed to extremely low contrasts, which of course necessitates overexposure and the use of undesirably soft papers for printing. The tested speed claims were not valid—most all developers of this type showed a loss of film speed instead. The experienced photographer may be able to see through the claims advanced but the beginner is bound to be bewildered and may, after many disappointments, give up his newly found hobby altogether. The goose that lays the golden egg is going to be strangled yet. The cleverer firms employ well known names to sponsor or write about their products. The feelings of these individuals as they write about " Super Deluxe Soup AAZ " should be interesting. Either they are partaking of the beguiling business knowingly or they are sadly lacking in photographic knowledge. The ballyhoo sounds convincing enough at first sight but careful examination shows the " proof " illustrations to be made at various gammas, exposures or densities so that they are meaningless. Comparison prints showing lack of halation with " Super Special Minus Grain " developer, as compared with some standard, and pictures showing the small grain size produced in the negatives, are generally made under such varying conditions that the comparison is simply not valid. The consumer is being duped and sold a product far inferior to its claims. The debunked claims of many of these products should be carefully studied in the series of papers in "Photographic Retailing," written by Willard Morgan, starting in the September, 1939, issue.

The rapidly increasing use of color photography has led to some rather optimistic claims in this field also. For example, some color cameras are described as being so good that no masking or color correction is needed. Masking, as commonly known, is generally employed to compensate for the deficiencies in the inks or dyes used during printing and has little or nothing to do with the negative production. A camera making color separation negatives that depends on such a claim to prove its excellence gives rise to doubts as to the reliability of the product. Some of the dyes supplied for three color printing are neither of the correct hues nor light fast, as described in their literature. In fact, some such dyes, after being transferred to paper and exposed to sunlight for about one hundred hours completely fade out, leaving blank white paper—dyes the photographer bought to make permanent pictures!

Another evidently lucrative field is in bottling products already available and selling them at greatly increased prices under a new label. Published material is often presented to the public as a new discovery created by the sponsoring individual. The descriptions and originality claims would be laughable if it were not for the feeling that will inevitably be created that firms selling photographic products are simply misleading the public for personal gain. Such a state will be reached shortly unless some curb is put on the unscrupulous tactics of a few individuals. The large photographic manufacturers are continually marketing products of

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Photographing Minerals and Their Optical Phenomena in Color

By B. M. SHAUB *

Photographing minerals and their optical phenomena in color offers a variety of problems in macro- and micro-photography due to the extreme variation of color density which may occur frequently in the same specimen, the great variation in relief of micro crystals and the high reflections frequently obtained from the many crystal faces occurring on some specimens. The equipment and procedure used in meeting these conditions are described.

PHOTOGRAPHING minerals in natural color offers a number of complications not inherent in photographing many of the other natural objects such as flowers, plants, birds and animals in general.

The smaller mineral specimens which are often mounted in special black-lined boxes, about 7/8 inches square, and known to mineralogists as " micro-mounts ", frequently contain crystal-lined depressions or irregular surfaces which often have a greater relief than the depth of field of micro-lenses necessary to produce images of the desired size. This is especially true for magnifications of from 25 to 45 diameters, or greater, of small crystals about one-half millimeter in size and which form groups lining depressions or covering projecting bosses of the specimen. In such instances the background crystals are always out of focus to a greater or lesser degree. In photographing the larger specimens where the image is reduced in size the specimen can usually be photographed so that the image is in sharp focus throughout.

Mineral specimens of most collections are indeed very specially selected. The rocks of the entire earth consist wholly of minerals; however, rock samples are very seldom included in mineral collections because of the special requirements for mineral specimens.

This specialized requirement brings into the problem of color photography many complications. The average specimen consists of two or more mineral species which may have vastly different physical properties. The color of some of the minerals of a specimen may be a very light pink, green or any of the seven common colors, others may have such dense colors that the combination cannot be correctly exposed owing to the rather narrow exposure range of color plates or films.

Good mineral specimens usually consist of a group of fine and rather perfectly formed crystals which are pleasingly and more or less uniformly disposed upon one of the larger surfaces of the specimen. As the crystals are usually bounded by highly reflecting faces, or planes, considerable and continued patience is required in arranging and rearranging both the lights and specimen in order to eliminate as far as possible all objectionable reflections which may produce haloes if the full intensity of the light is reflected through the lens.

This same property of reflection must often be called upon to give form to good transparent crystal specimens which would otherwise photograph as masses of uniform color in outline but without form or relief. To secure the best form calls for adjusting the lights and specimen until *very faint* reflections are obtained from the particular crystal faces which will outline the greatest number of additional faces on the crystal and still properly illuminate the specimen.

Many specimens may contain transparent minerals which are colored to varying densities. These frequently act as filters and they may consequently change the color of adjacent minerals especially those lying within or near their shadows or refracted light. In the event a blue mineral is associated with light green ones, a Kodachrome transparency may show the green minerals as having a definite bluish color.

With other types of color films or plates other colors may predominate depending on the sensitivity of the plate or film for some particular color, the color density, abundance of transparent colored minerals and the angle of illumination.

Specimens which contain groups of colored and colorless transparent minerals may appear as strikingly brilliant, colorful, and pleasing to the eye while the color transparency may show the colored minerals as being very attractive yet the colorless ones usually appear as uninteresting colorless areas without form due to the flat illumination necessary for color photography. In such cases a compromise in using a more contrasty illumination must be resorted to otherwise it will usually be better to select only the best group of colored minerals for the picture, omitting the larger areas of the colorless ones.

Total reflection from within some particular transparent crystal may cause one or more of the faces to appear very dark and show black undesirable areas on the particular crystal in the color transparency.

Minerals vary considerably in the degree of luster or brilliancy which as a rule cannot be reproduced, in degree, photographically. However, this feature is less objectionable than the others and at times the color transparencies appear to have reproduced the brilliancy of the specimens to a remarkable degree.

While the above features of minerals complicate the technique of photographing them, it is possible to obtain fine color pictures. If the public understood and appreciated minerals as well as it does flowers, birds, animals, children and pretty girls, many photographs of the finer mineral specimens would undoubtedly appear more frequently in color on magazine covers and in advertisements.

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Cameras and Accessories

The range of magnifications required for photographing mineral specimens may range from 50 times to one-tenth natural size when photographed on 3¼ x 4-inch, or standard, lantern slide plates for projection in the common projection lanterns. This size is also suitable for reproduction by photo-mechanical or other processes except from screen plates when very large sized reproductions are required.

The cameras that are available for this range of magnifications are numerous and vary considerably in form, size and method of operation. Either of three types of cameras are preferred by the writer depending upon the size of the specimens to be photographed, whether the specimens can be made available at his laboratory or if they are in some private collection.

The camera most preferred by the writer is a medium-sized photomicrographic stand which can be used in either a horizontal or vertical position. For very small minerals or micro-crystals the camera should have a total bellows extension of 20 to 25 inches. The medium-sized photomicrographic stands on the market have sufficient length of bellows and are usually sufficiently rigid as well as flexible in operation to provide a wide range of adjustments and are able to accommodate a series of lenses ranging in focal lengths, from around 15 mm (8 mm moving picture camera lenses) to 180 mm. All lenses should be fitted with diaphragms. As the lensboards of photomicrographic cameras are rather large, the short focal length lenses (up to 48 mm focal length) should be mounted in the small end of a rigid conical extension having the large end of the cone threaded to fit the threaded ring of the lensboard. This permits one to illuminate the small specimens and micro-mounts from a higher angle and thus avoid the otherwise long shadows. The conical lens holder also provides additional bellows length. The 4 x 5-inch revolving-back Autograflex has a bellows extension of 18 inches and is very satisfactory when used with a tilting head tripod which may be raised and lowered by a suitable rack and pinion device to facilitate adjustments for specific magnifications. A conical lens adapter for the micro-lenses may also be used equally well with the Autograflex which makes it a desirable portable camera for photographing small to medium sized specimens.(1)

Another camera for photographing medium to large sized specimens is the 3¼ x 4½-inch or 4 x 5-inch Speed Graphic. The latter is provided with 3¼ x 4-inch or 3¼ x 4¼-inch home-made kits for either films or plates.

The Speed Graphic cameras are somewhat lighter in weight but as the illuminating apparatus requires more than manual transportation, if any distance is involved, the lighter weight of the camera is not much of an advantage. Any of the smaller view cameras, as the 4 x 5-inch size, may be used almost as readily as the medium-sized photomicrographic stands, Autograflex, or the Speed Graphic cameras.

Miniature and other cameras also may be used to photograph minerals in color, but they do not readily lend themselves to the necessary and desirable adjustments and are not, in general, adaptable to the interchangeable use of the various color films and plates to make them especially desirable.

For the average specimen, the vertical position of the camera is most desirable as it permits one to place the specimen on a small table having telescopic legs for additional adjustment in height which facilitates the changing from large to small specimens.

Mineral specimens are generally rather angular in form and usually need to be tilted into some special position to orient the best surface for the photograph in a plane perpendicular to the axis of the camera, or in any other desirable plane. To accomplish this the writer has constructed a platform supported on a hemispherical under surface about two inches in diameter resting in a hollow cylindrical pedestal so that the specimen can be tilted to an angle of about 30 degrees in any direction. In the event a greater angle is desired the specimen may be given an initial tilt by blocking it up in about the desired position with plasticene. The final tilt and orientation can then be accomplished easily by means of the spherical support. This arrangement speeds up the orientation of the specimens so that more than double the number of specimens can be photographed in a given time.

The backgrounds for the specimens consist of 3/8-inch plyboards covered with different colored velvets. These are interchangeable so that a background may be selected that harmonizes with the particular mineral group to be photographed.

Lamps and other accessories are attached to iron supports of varying lengths such as are used in chemical and physical laboratories. The holders used for supporting and adjusting them consist of two short pieces of aluminum rod 4 inches long. Proper sized holes are drilled through the rods so that one end of the larger rod will receive the smaller rod; the opposite end of the larger rod is drilled at right angles to the first hole and of the correct diameter to pass over the upright stem of the iron support. The other end of the smaller rod is drilled to take the supporting stem of the lamps or other apparatus to be oriented into any desired position. Thumb screws, ¼-inch in diameter, are used to hold the supporting parts in position and on the iron stands. The assembly of lamps and other devices may be readily moved into any position to secure the most desirable illumination.

When using small arc lamps to illuminate very small micro-minerals, the accompanying radiant heat is focused upon the same area producing an intense and concentrated heat which will ignite paper. This concentrated heat will seriously affect many of the colored minerals that contain water which is often rather loosely held in the crystal lattice. By expelling even a small amount of water by heating, the color of a mineral is often changed or even caused to disappear entirely. The difficulty of overheating may be satisfactorily remedied by using water cells in the light path from the arc lamps. The water cells can be constructed from brass pipe and rod. The diameter of the pipe should be 2½ to 2¾ inches and the distance between the glass windows from 1½ to 2 inches. The windows can be held between gaskets by flanges which screw over threaded ends of the brass pipe. The supporting stem may be of ⅜-inch brass rod soldered to the body of the cell. The neck, for filling, may be made of ¾-inch brass pipe one inch long soldered to the cell body at right angles to the supporting stem. The neck should be closed with a cork containing a short piece of glass tubing, bent about 45 degrees, to provide for expansion of the water as it absorbs the heat during use.

The converging or magnifying lenses should be of 50 mm focal length.

Illumination, Filters, Color Plates and Films

It is desirable to select a color film, or plate, and a light source which can be used without a filter. However, such a combination is not always possible for the best results with all subjects. For photographing the larger specimens the writer uses Kodachrome Type B film and 3200°K Mazda lamps. It is usually necessary to use two lamps, one on either side to avoid too contrasty illumination. When two 500-watt lamps are used on the average lighting circuit the line voltage at the lamps is reduced to about 104 volts which varies with the number of other lamps or electrical appliances in the circuit. Hence, to obtain sufficient light intensity and the correct color temperature, 3200° K, 500-watt, 100-volt, type 25A Mazda lamps are used in connection with a variable potentiometer and voltmeter to reduce the excess line voltage to 100 volts.

When one cannot control the voltage to the required value to give the rated color temperature of 3200°K, or when the color temperature rating of the light source is unknown, one may make proper compensation for the Type B Kodachrome film by using the Eastman Color-Temperature Meter in conjunction with the available set of Wratten Color Compensating Filters. It is more desirable to use a lamp of correct color temperature rating and be able to control the voltage as needed, for it is often inconvenient to apply color compensating filters when using the micro-lenses.

Very small objects require an intensive illumination when the image is greatly enlarged, otherwise it is difficult to compose the picture and focus the image on the ground glass; in addition, a greatly prolonged exposure would be required. To avoid these difficulties two small arc lamps like those employed in mineralogical and petrological laboratories for microscopic work are used. Certain types of these small arc lamps may be removed from the base furnished with the instrument and then attached to the iron supports previously described. The light from the arcs can be focused onto a spot as small as one-quarter inch in diameter or it can be spread over an area several feet in diameter by using, in either case, a 50 mm magnifying lens. A distinct advantage of the arc lamp over the tungsten filament lamps lies in the ease with which the beam of light can be directed and controlled.

The combination of two 3200° K, 500-watt, 100-volt Mazda lamps controlled by a suitable potentiometer and voltmeter, produces good results when used with Kodachrome Type B for all colors except bluish green. Type B Kodachrome transparencies of bluish green minerals when returned from the Eastman Kodak Company are invariably bluer than the specimens.

Bluish green and green specimens are easily photographed on Finlay-Eastman color plates with Mazda or arc lamp illumination when used with the recommended filters. The small arc lamps employed in mineralogical and petrographical laboratories for microscopic work are not to be classed with the so-called " white-flame " arcs which have a color temperature near that of sunlight. The small arcs have a color temperature of approximately 3350°K as determined with an Eastman Color Temperature Meter. A Wratten CC14 filter is needed when small arc lamps are employed with Kodachrome Type B film and when they are used with Finlay-Eastman color plates the Wratten-Finlay filter No. 4547 should be used instead of the filter recommended for the white-flame arc.

Minerals whose colors are predominantly yellow are difficult to photograph on Finlay-Eastman plates, while they are easily photographed on Kodachrome films. The use of the Type B Kodachrome or Finlay-Eastman plates makes an ideal combination for any particular specimen unless it contains a combination of yellow and bluish green mineral species. The Finlay-Eastman plates have a desirable advantage in that anyone familiar with black and white photo-finishing can process the plates with ordinary dark-room equipment. In addition the Finlay-Eastman color plates may be easily duplicated by a simple black and white printing process on sensitized glass plates as in the making of black and white lantern slides.

Photographing the Optical Phenomena of Minerals

Most of the transparent substances which have a crystalline structure possess the property of double refraction to a greater or lesser degree. When thin sections or small fragments of doubly refracting substances are oriented between polarizing prisms, or plates, certain areas of a given crystalline substance, depending upon the thickness of the fragments or sections, become colored due to the interference of the polarized light in passing through the doubly refracting substance in different directions. These colors are known as polarization colors.

Most minerals, especially those which occur in rocks of all kinds, are doubly refracting and as a consequence are examined by means of the polarizing microscope.

In the study of the optical properties of minerals, color transparencies are helpful when used either by projection or by direct observation over an illuminated viewing screen. Color transparencies of the polarization colors are easily made through the polarization microscope in essentially the same manner as making black and white photomicrographs under crossed polarizing prisms, or plates. The polarization colors of larger areas may be photographed in natural color by the use of polaroid(2) for the polarizing medium and instead of the microscope one may use the photomicrographic camera equipped with lenses of 16 to 48 mm focal lengths.

Another optical phenomena of minerals, which produces striking and useful color transparencies, is that of the optical " interference figures " which must be photographed in the same manner as that used in making photomicrographs of thin sections after making the necessary changes in the optical system of the microscope. A very great difference in magnification is required. The photography of polarization effects of mineral fragments or thin sections in color usually requires a magnification of from 10 to 50 diameters while the optical interference figures require a magnification of the order of 2000 diameters and consequently a much longer exposure.

The optical interference figures of certain minerals show the property of dispersion of the optic axis to a varying degree depending upon the symmetry of the crystal structure, temperature wave length of the light used and other conditions. Dispersion causes the shifting of the normal position of certain colored features of the interference figures, hence color transparencies of these figures provide a better medium for visual instruction than observing the phenomena with the polarizing microscope.

The same sources of illumination may be used as for direct micro- or macro-photography. When filters are required they should be interposed between the light source and the microscope or polaroid plates. In the event the radiant heat from the light source is appreciable it is desirable to use a water cell between the light and the filter.

Determining Correct Exposures

Success in making faithful color reproductions of minerals, as well as other subjects, depends to a great extent upon the exposure. The cost of making color transparencies is an important item, especially when there are many failures resulting from incorrect exposures. When photographing the larger mineral specimens a photoelectric exposure meter may be used by increasing the exposure meter reading from 1¼ to 2½ times as the working distance or the distance from the lens to the object decreases or as the magnification increases. When making exposures of small objects near natural size or enlarged an increasingly longer exposure is required for a given intensity of illumination.

When working with Kodachrome Type B color film one may make a strip exposure of the subject on Portrait Panchromatic film, selecting for the mean of the exposures for the test strip the best estimate which will vary with the type and wattage of the light source, magnification, stop, and other factors. When using two 500-watt Mazda lamps from two to three feet from the subject the exposure for the Portrait Panchromatic film varies from one-half to three seconds at f 22. The correct exposure for the Type B Kodachrome will be approximately three times the correct exposure as determined from the correctly exposed strip on the Portrait Panchromatic film; the Weston ratings are 6 and 16 respectively for Mazda illumination.

When using combination screen plates or films one may likewise make a strip exposure on Portrait Panchromatic film and use the proper multiplying factor for the screen plate as determined from the ratio of the speed of the Portrait Panchromatic film to the speed of the color plate or film as given on " Weston Emulsion Ratings " sheet or any other data sheet giving comparative emulsion speeds of photographic films and plates.

The correct exposure for the Finlay separate screen color plate process may be determined by making a strip exposure on the relatively inexpensive Finlay-Eastman Panchromatic plate regularly used in making the Finlay color transparencies, and then selecting the strip which is correctly exposed for making a print on Azo No. 3 paper.

The exposure test strip method, while economical in material is somewhat laborious, time consuming, and requires a laboratory at hand at all times to develop the test strip negatives. To eliminate this procedure the writer has invented an exposure meter which is used to determine the exposure directly on the ground glass, at any magnification or condition of illumination, thereby making it possible for inexperienced photographers to obtain a correct exposure of an object in a relatively few seconds.

Exposure meters using photoelectric cells in series with a sensitive galvanometer may be used after proper calibration. Such devices are more of the nature of a laboratory set-up and are not so desirable where one must change the location of the camera set-up frequently as in museums and private homes.

LIST OF REFERENCES

1. Shaub, B. M., Photographing Small Minerals in Color, *Photo Technique,* Vol. 2, No. 5, pp. 34–37 and front cover, May, 1940.

2. ——— On the Use of Polaroid for Photographing Large Thin Sections in Crossed Polarized Light, *Amer. Min.*, Vol. 21, pp. 384–386, 1936.

3. ——— Some Applications of Natural Color Photography in Mineralogy, *Amer. Min.*, Vol. 23, pp. 20–29, 1938.

PHOTOGRAPHIC ADVERTISING

(Concluded from page 17)

repute which are reasonably advertised. The claims in such advertisements can be substantiated. Often they are not so glowing or so full of superlatives as the competitive materials, but they can be depended upon—something that the fly-by-night firms and products cannot be. The careful photographic dealer is not to blame for this state of affairs because in many cases large scale advertising has made his customers ask for certain products with which he must stock his shelves. After a short period of time, the product is lost in the influx of new materials and the dealer is left with a stock of material that he finds difficult to move at cost. The earnest photographer should make every effort to avoid such products and to steer new arrivals in the photographic firmament away from these materials. If people do not buy these unreliable products, it will soon become uneconomical to place them on the market and we may have a return to sanity in photographic advertising.

Operating Characteristics of Photoflash Lamps and Synchronizers

By W. E. FORSYTHE and ADELAIDE EASLEY *

It is necessary for present day usage that the photoflash lamp and the synchronizer used to flash it and to open the camera shutter at the proper time must be well matched. The photoflash lamps are designed to reach their peak of intensity, which is ample to take the picture, in twenty milliseconds after the current has been turned on. Characteristics of different photoflash lamps and synchronizers are discussed in this paper, giving some of the conditions that must be fulfilled if the camera shutter, the photoflash lamp and the synchronizer are to keep in step. Some of the causes of poor synchronism are also discussed.

UP until ten or fifteen years ago, not a great deal of thought was given to special light sources for photography, but now the General Electric Company makes and offers to the public nine photoflash lamps, seven tungsten filament photoflood lamps, five tungsten lamps for use with type " B " Kodachrome, and a number of tungsten lamps for use in the moving picture field. Other manufacturers list a like line of photographic lamps.

This paper will describe one of these sources—the photoflash lamp—giving some of its characteristics as a light source and also something about methods of using it.

There are three factors in photography that determine whether the negative has been properly exposed. These factors are the character of the optical system, the sensitivity of the photographic emulsion, and the exposure. The makers of photographic films and of photographic lenses have produced faster lenses and more sensitive films and plates and thus have made it possible to get a satisfactory negative with less exposure. The demand for action pictures, however, has made necessary the use of faster shutter speeds. Since exposure is the product of time and illumination, when the time is decreased, the illumination must be increased in the same ratio either by increasing the intensity of the light source or by decreasing the distance between the source and subject. When the distance is decreased, the illumination on the subject is increased in inverse ratio to the square of the distance. This fact makes it possible to approach the illumination of the sun by using sources of much less intensity at short distances. Therefore, lamp manufacturers have developed photographic lamps that when used at reasonable distances from the subject, make possible the use of the same exposure times as are used in daylight photography.

Photoflash Lamps

About ten years ago,[1] the General Electric introduced into this country a photoflash lamp which consisted of a bulb containing about 65 mg. of very thin (.00004 cm.) aluminum foil, pure oxygen to a pressure of 170 mm. of mercury, and a small filament covered with a primer which would flash and ignite the foil when the filament was heated by an electric current. As the lamp was then made, it gave a flash of short duration and of enough intensity to take a picture under average conditions.

This photoflash lamp found use in two different fields. Amateurs used the lamp to take pictures by opening the shutter, flashing the lamp to expose the film, then closing the shutter. For subjects and objects not moving, very satisfactory pictures were obtained. Almost immediately another use developed for this lamp. It was used as a light source to take snapshots for very short times of exposure. To do this, the flashing of the lamp and the opening of the camera shutter were synchronized by an apparatus called a synchronizer or a flash gun so that shutter speeds of 1/100 to 1/500 of a second could be used. At first no definite attempt was made to produce a flash lamp with a constant time delay between starting of the current and the peak of the flash, but when this new use developed, the lamps were designed so that there was a time delay of 20 milliseconds between the turning on of the current and the peak of the flash.

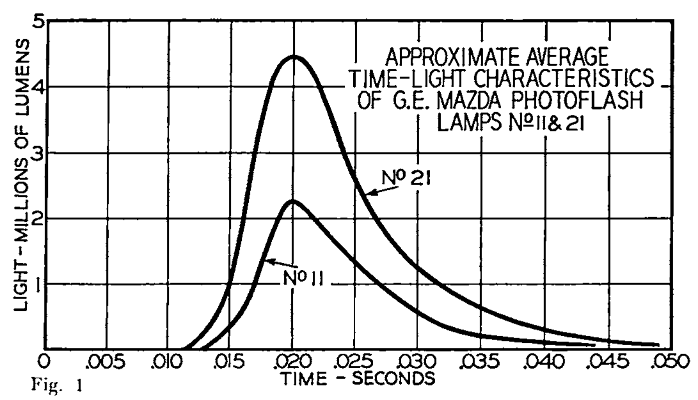


Fig. 1

Wire Photoflash Lamps

The narrow time-intensity peak of these foil-filled[2] photoflash lamps (Fig. 1) did not offer much leeway for variations in the time characteristics of the lamp or in the timing of the flash gun or camera shutter, and it did not seem possible to improve these characteristics very much. However, the substitution of wire filling for the foil filling gave a lamp with a much wider time-intensity trace (Fig. 2) than the foil-filled lamp. The first of the new wire-filled photoflash lamps were designed

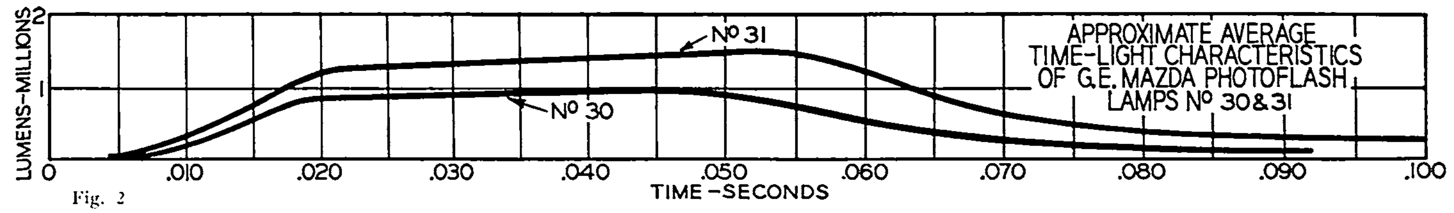


Fig. 2

to give about the same light output and the same time to the peak of the flash as the foil photoflash lamps.

As new demands developed, new lamps were brought out so that now there are four foil-filled, four wire-filled and one shredded-foil-filled Mazda photoflash lamps offered. The latest of these lamps is the #5, a shredded-foil-filled lamp, which was developed to supply the need for a lamp smaller in size but still having enough light output so that it can be used for many purposes. This lamp has a single-contact bayonet base which makes for easier mounting of the small lamp.

Characteristics of Photoflash Lamps

There are a number of radiating and time characteristics that have to be known to describe the radiation from the photoflash lamp so as to be able to appraise its value as a light source for photographic purposes. These are the spectral character of the radiation, the total quantity of light emitted, which is the average luminous flux multiplied by the time of the flash, the maximum luminous flux of the radiation, and the time characteristics, such as the time from the start of the current through the filament to the start of the flash and to the peak of the flash and finally the total duration of the flash above a certain intensity. These time and radiation characteristics of the flashing lamp can be measured by exposing, through a small slit, a moving photographic plate or film to the light from the lamp and then studying the density of the resulting photographic trace which varies the same way that the light output varies. A photographic film thus exposed is used for measuring the time characteristics of the lamp, but there is too much work involved in this method to make it practical for measuring the radiation characteristics, so other laboratory methods had to be developed.

For testing these lamps in the laboratory, a rotating flashometer[3] is used. The resistance in the lamp circuit of this instrument is very low (0.1 ohm) and its contacts show no vibration when tested with an oscillograph. For most of the testing, a four-volt storage battery of about 100 ampere-hour capacity is used. However, part of the tests are made with dry cells as a source of power. The wire photoflash lamps as now made will flash on one penlite cell under proper circuit conditions.

When work was first started on the measurement of the characteristics of the photoflash lamp, there was some question about the units to be used for the light output of the lamp. After discussing it with some of the engineers who are working on problems that have to do with photography, it was decided to use the regular unit of flux, that is, the lumen.* Two reasons might be given for this choice. In the first place, if a photographic unit were used, it would apply only to a single emulsion and a correction factor would have to be used for other types of emulsions. In the second place, the photographer examines his subjects and the final pictures with light, that is, by eye observations, which indicates that a light unit should be used. For these reasons the total quantity of the light radiated is given in lumen-seconds and the maximum luminous flux is given in lumens. The time is recorded from the start of the current through the filament and is given in milliseconds. Then to help the photographer in determining the photographic effect of the different lamps for different emulsions, some information concerning the spectral characteristics of the emitted light, that is, something concerning its color, is given.

The picture obtained depends not only upon the intensity of the light but upon its quality or character, which is given by the energy distribution in the spectrum, that is, by the energy radiated at the different wavelengths *i.e.*, the different colors. The color-wavelength relation is about as shown in Table 1.

TABLE 1

Color-Wavelength Relation

Color	*Wavelength in A°*
Ultraviolet	Shorter than 4000
Violet	4000 to 4500
Blue	4500 to 4900
Green	4900 to 5500
Yellow	5500 to 5900
Orange	5900 to 6300
Red	6300 to 7600
Infrared	Longer than 7600

Spectral Characteristics

There are two or three methods in general use for describing the spectral character of the different sources. One method is to give a curve (for sources having continuous spectra) showing the intensity of the radiation for different wavelength intervals. The curves in Figure 3 show this method for three different light sources. A second method is to give the color temperature of the source. The color temperature of a source is defined as the temperature at which it is necessary to operate a blackbody so that the light it emits has the same integral color as that of the source considered. Thus, for example, when a tungsten filament is said to have a color tem-

* Lamp Department, General Electric Co., Cleveland, Ohio.

1. W. E. Forsythe & M. A. Easley. Jl. Opt. Soc. Amer., Vol. 21, page 685, 1931.

2. W. E. Forsythe & M. A. Easley. Jl. Opt. Soc. Amer., Vol. 24, page 195, 1934.

3. W. E. Forsythe & M. A. Easley. Rev. Sci. Instruments, Vol. 5, page 216, 1934.

* LUMEN, the unit of light flux, is the rate at which light falls on a unit area, all points of which are at unit distance from a uniform point source of unit candlepower. On account of the inverse-square law for illumination, the unit distance may be 1 cm, 1 inch, 1 foot, 1 meter, etc.

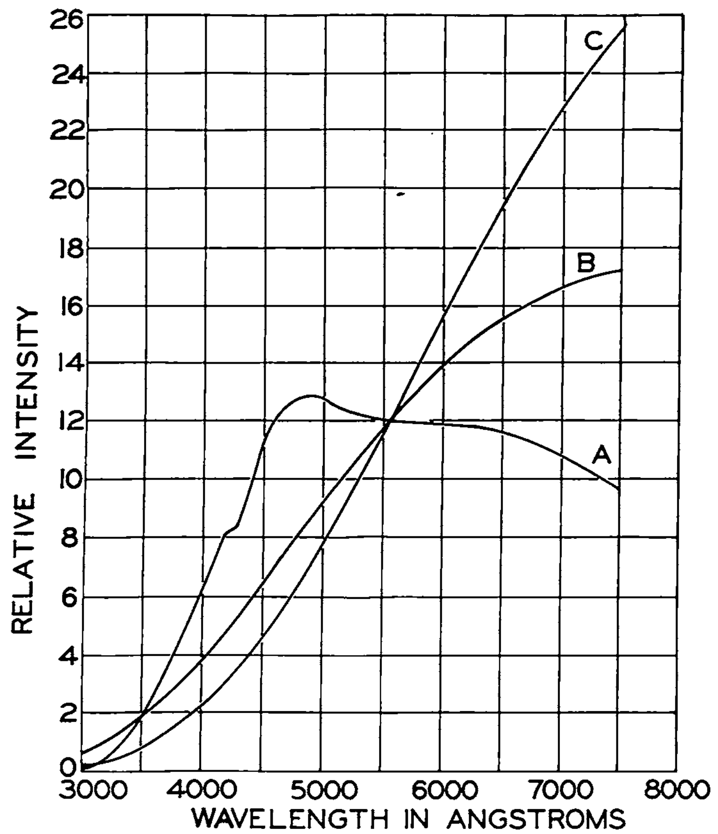


Fig. 3. Relative spectral distribution of three sources. Curve A, the sun; Curve B, photoflood lamps; and Curve C, the 115 volt, 500 watt, 1000 hr. life tungsten filament lamp.

perature of 3200° K. it means that the light from the tungsten lamp has the same integral color as that from a blackbody operated at a temperature of 3200° K. Color temperatures are usually assignable only for sources of continuous radiation which give a spectral distribution not greatly different from that of a blackbody. When such sources are at the same color temperature they have very nearly the same relative spectral distribution.

Artificial sources can be used as well as daylight with orthochromatic and panchromatic films although the color temperature of ordinary Mazda lamps is only about 2900° K., of photoflood lamps about 3400° K. of the regular photoflash about 3550° K. and of daylight about 6500° K. The Kodachrome and Dufay films, however, require sources radiating light of a very definite quality if the transparencies are to reproduce colors accurately. For this reason, a lamp having the proper color temperature must be used with these films. Since the Type A Kodachrome is corrected for a color temperature of about 3450° K., any of the G.E. photoflash lamps except the 21B can be used. With the Type B (professional) Kodachrome, which is corrected for a color temperature of 3200° K., better results are obtained if a filter is used with photoflash lamps to decrease the intensity of the blue.

Photoflash Lamp for Color Photography

Sometimes there is a need for a photoflash lamp to supplement daylight for taking color pictures with daylight Kodachrome or Dufaycolor film. This requires a bluer light (*i.e.*, higher color temperature than the regular photoflash lamp), which can be produced by coating the bulb of the regular photoflash lamp with a blue lacquer. The Research Laboratory of the Eastman Kodak Company developed a blue lacquer that has such a transmission (Figure 4) that the light from the photoflash lamps when transmitted through it is of the proper color to supplement daylight for taking pictures with Kodachrome film balanced for daylight. The heavy curve shows the spectral transmission of the blue lacquer and the dotted curve shows the transmission of an ideal screen that would transform the light from the #21 photoflash lamp to a color temperature of 6500° K., which is within the range of color temperature of the light for which this type of Kodachrome and Dufaycolor film is balanced. The difficulty in obtaining the proper transmission of a blue lacquer for this purpose lies in getting the transmission in the yellow-green part of the spectrum properly balanced with that of the ends of the spectrum. Some dyes that were tested gave the proper red-blue relation but the intensity of the yellow-green transmission was about 30% too high. Data on this blue photoflash lamp (#21B) along with that of other photoflash lamps are given in Table 2.

TABLE 2

Characteristics of G. E. Photoflash Lamps

Lamp No. →	*5*	*7*	*16A*	*30*	*31*	*11A*	*21*	*21B*	*75*
Bulb	B11	A15	A17	A17	A21	A15	A19	A19	PS35
Bulb volume (cc)	24	70	95	95	190	70	140	140	800
Filling	†	Wire	Wire	Wire	Wire	Foil	Foil	Foil	Foil
Total light output in lum.-sec.	16,000	27,000	40,000	42,000	75,000	20,000	50,000	17,000	160,000
Output in lum.-sec. in interval 0.016–0.024 sec. after close of circuit*	7,500	10,000	16,000			10,000	22,000		
Max. flux in million lumens	1.2	1.5	2.6	1.0	1.5	2.4	4.5	1.6	13
Time in sec. from close of circuit to:									
Peak of flash*	0.020	0.020	0.020			0.020	0.020	0.020	0.035
One-half max. int.*				0.015	0.018				
Filament burn-out*	0.0035	0.0025	0.0025	0.0030	0.0015	0.0030	0.0015	0.0015	
Effective duration of flash (sec.)‡	0.015	0.020	0.030	0.050	0.065	0.015	0.025		0.040
Color Temp., °K	3600	3650	3600	3600	3600	3450	3500	6300	3450

* Lamps flashed on 4 volts.
† Shredded foil filled.
‡ Approximate duration of light intensity above a half million lumens

Photoflash Lamps for Focal Plane Shutters

A need developed for a photoflash lamp to use with the focal-plane shutter as well as the one for use with the between-the-lens shutter. A focal-plane shutter consists of a curtain with a slit that passes just in front of the film or plate and thus exposes each portion of the plate for a definite short time, determined by the width of the slit and the speed of the curtain, as it passes to the other edge of the plate. As this curtain moves in general with acceleration, the last part of the plate passed over is exposed for a shorter time than the first part of the plate. Some focal-plane shutters are so operated as to minimize this variation in the time of exposures at the two edges of the plate. The curtain requires twenty to sixty milliseconds to pass across the plate and thus a photoflash lamp for this service should give a definite high intensity for about this time interval.

For use with a shutter that moves with acceleration, it would be desirable for the intensity to increase slightly with the time so that the last edge of the plate would receive about the same amount of light as the first edge. In addition, the lamp should reach a high intensity at a definite time after the current was started through the filament so that it would be possible to synchronize the starting of the flash and the starting of the curtain. By using definite amounts of two selected sizes of aluminum wire, a lamp was developed that gave the proper time lag in starting and the proper intensity distribution for this service. Data on these lamps (#30 and #31) are given in Figure 2 and Table 2.

Reflectors for Photoflash Lamps

The values given in Table 2 for light output are for lamps flashed in the open. The amount of light available for taking a picture can be increased several times by using an efficient reflector behind the lamp. Unfortunately, many photographers and some equipment manufacturers have felt that the main purpose of the reflector was to shield the photographer's eyes from the light of the lamp. Before the advent of the #5 lamp little attempt was made to design reflectors for the concentration of light on the subject. A very inefficient utilization of the radiation from the lamp resulted from spreading the light over a much larger angle than that covered by the camera lens. For example, a popular five-inch reflector when used with the #16A lamp increased the amount of light falling on the subject by a factor of 3.4 over a bare lamp. A six-inch reflector of somewhat different design gave an increase of 5.7 over the bare lamp with the #16A bulb, but only a 3.8 increase with the #21 lamp. A larger reflector giving a 50–60° beam would have given a greater efficiency than either of these reflectors.

Shortly after the #5 lamp was brought out, special reflectors were introduced for use with this lamp. The small size of the bulb made it possible to obtain greater efficiency and control of the beam with five to seven-inch reflectors. As a result, these special reflectors designed to give a beam of 50–60° direct ten times as much light on the subject as would be obtained with the bare lamp. Reflectors having a beam angle of 25–30° give an

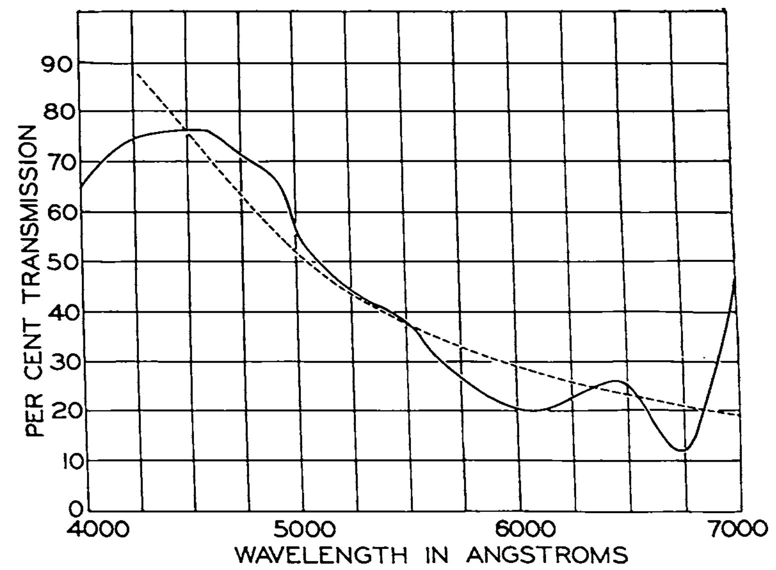


Fig. 4. Spectral transmission of blue lacquer used for daylight photoflash lamp (solid curve) shown in comparison with ideal filter for changing color temperature of No. 21 photoflash lamp to 6500° K.

even greater increase in illumination of the subject. Thus because of the greater efficiency of the reflectors, the small #5 lamp can be used for the same type of work as the larger lamps in the poorer reflectors, and because a small source is more easily controlled, the focusing reflectors can be used for special spotlight effects at greater distances than the larger lamps.

Factors Affecting Lamp Timing

Not only do photoflash lamps have to be carefully made, but they have to be flashed under proper conditions or the time lag will be increased more than is allowable for synchronization. The effect of resistance upon the timing of photoflash lamps is shown in Table 3.

TABLE 3

Effect of Resistance on Timing of Photoflash Lamps Flashed on 3 Volts (Two Type D Dry Cells)

Resistance (ohms)	*Avg. Time (Sec.) From Contact to Peak of Lamp Flash* — *No. 21 Lamp*	*No. 16A Lamp*	*No. 5 Lamp*
0.1	0.020	0.020	0.020
0.6	0.022	0.021	0.022
1.1	0.035	0.022	0.023

This resistance may be in the contacts, in the circuit wiring, or in the battery itself. Contact resistance in a well-made synchronizer should be less than 0.1 ohms, but as the gun is used, the socket contacts become dirty and the spring weak, wires loosen, and, in the mechanical type of synchronizer, the synchronizer contacts become worn and dirty. This added resistance may seriously affect the synchronization. The use of long lengths of small wire for extension lighting also may cause trouble. Since twenty-five feet of #18 lamp cord has a resistance of about 0.5 ohms, this length is about the greatest that can be used without throwing the lamps out of synchronism. If a longer wire is necessary, #16 or #14 lamp cord should be used.

Battery resistance also may seriously affect the timing of the lamps. The type D cells which are usually used have a fairly low internal resistance. Smaller batteries have a higher resistance, that of the penlite cells being two or three times as great as that of the type D cells. The internal resistance increases with the age of the battery and thus may cause trouble, especially in the case of the smaller batteries. For example, #21 lamps flashed on three type D cells that were partly discharged, reached their peak intensity about .002 seconds later than similar lamps flashed on new cells. A comparison of the timing of lamps flashed on penlite and on type D cells and the lag for various voltages is given in Table 4. It will be noted that there is little change in peak lag as the voltage is increased from 3 to 18 volts.

TABLE 4

EFFECT OF VOLTAGE ON TIMING OF PHOTOFLASH LAMPS

Voltage	Cell Type	*Avg. Time (Sec.) From Contact to Peak of Flash* No. 21 Lamp	No. 16A Lamp
1.5	Penlite		0.025
	Type D	0.035	0.022
3	Penlite	0.023	0.023
	Type D	0.020	0.020
4.5	Type D	0.019	0.019
9	Type D	0.019	0.019
18	Type D	0.018	0.019
110	A.C.	0.015	

SYNCHRONIZATION OF LAMP AND SHUTTER

It requires about 5 milliseconds for the average camera shutter to open after it has been tripped. With a time to peak of 20 milliseconds for the photoflash lamp this requires an additional delay of 12 to 15 milliseconds in the shutter opening, depending upon the speed of the shutter used, for proper synchronization of the shutter and the lamp. Various types of synchronizers have been developed for this purpose.

A number of these synchronizers have been tested and for the most part, work very well. In some of the mechanical type synchronizers not enough care was taken with the various contacts with the result that the lamps flashed with them are erratic and occasionally fail to flash because of the high contact resistance. Several synchronizers had contacts that vibrated at the time of make and this increased the time to the peak of the flash of the lamp. Some of these synchronizers were so made that the way the tripper mechanism was pushed influenced the relative time lag of the lamp and shutter.

The principal difficulty found in the electromagnetic type of synchronizer was that the coil in parallel with the lamp to operate the shutter had such a low resistance that it required too much current for operation. This current drain is hard on the batteries and thus makes multiflash synchronization uncertain. One synchronizer that was tested had a spring socket for the lamp so made that occasionally the spring for the bottom contact pushed the lamp up so far that the lamp slipped up the width of one-half thread due to the small projection inside of the slip socket that was supposed to hold the lamp in place, and the bottom contact either was broken or had become very loose.

With the mechanical type of synchronizer the battery is used only for flashing the lamps. Thus more energy is available for this purpose than with the electromagnetic type of synchronizer using batteries of the same size. Because the coil is an extra load on the battery, the electromagnetic synchronizers usually operate on type D cells while the mechanical type uses the smaller type C. A comparison of the timing of lamps flashed in parallel on the two types of synchronizers indicates the effect of the coil. Data given in Table 5 were obtained with a professional-type synchronizer having a coil with resistance of approximately one ohm in parallel with the lamp. A 4 x 5-inch Speed Graphic camera with Compur shutter set at 1/200 second was used with the synchronizer set to center the shutter opening at 20 milliseconds with one lamp in the circuit.

TABLE 5

SYNCHRONIZATION OF PHOTOFLASH LAMPS FLASHED IN MULTIPLE ON A 4.5 VOLT ELECTROMAGNETIC SYNCHRONIZER HAVING A COIL RESISTANCE OF ONE OHM

Lamps in Parallel	*Time (Sec.) From Close of Circuit to* Peak of Flash No. 5	16A	11A	21	Start of Shutter Opening No. 5	16A	11A	21
1	.020	.020	.020	.020	.014	.014	.014	.014
2	.023	.020	.020	.023	.016	.015	.015	.015
3	.023	.021	.021	.027	.017	.016	.016	.015
4	.024	.023	.023	.028	.019	.019	.019	.017

It is important to note that while the lag of the lamps was increased, the action of the coil was slowed up so that the shutter opening was also delayed, and in the case of the #5, #16A, and #11A lamps, the shutter delay was actually slightly greater than the increase in lamp timing.

In contrast to these results, data on lamps flashed in multiple on a mechanical type of synchronizer showed no change in timing for one, two, three, or four lamps.

TABLE 6

EFFECT OF LAMP CIRCUIT RESISTANCE ON SYNCHRONIZATION. PHOTOFLASH LAMPS FLASHED IN MULTIPLE ON A 4.5 VOLT ELECTROMAGNETIC SYNCHRONIZER HAVING A COIL RESISTANCE OF 1.5 OHMS.

No. Lamps in Multiple	*Resistances (Ohms) in Circuit with Lp.** No. 1	2	3	4	*Time (Sec.) From Closing of Circuit to* Peak of Flash No. 5	16A	21		Start of Shutter Opening No. 5	16A	21
1	0				.020	.020	.020		.013	.013	.013
2	0	.2			.020	.020	.020		.013	.013	.013
2	0	.5			.020	.020	.020	.029†	.013	.013	.013
3	0	.2	.2		.023	.022	.022		.016	.015	.014
3	0	.2	.5		.023	.022	.023		.016	.015	.014
3	0	.5	.5		.022	.022	.030	.038†	.017	.015	.021
4	0	.2	.2	.2		.026	.028			.018	.021
4	0	.2	.5	.5		.026	.024	.034†		.019	.025

* Resistance of 0.2 ohms is equivalent to approximately 10 ft. of No. 18 lamp cord, and resistance of 0.5 ohms corresponds to 25 ft.

† Lamps did not all flash together and curve showed two definite maxima.

When the lamps are used at a distance from the flash gun so that additional wiring is necessary, the timing of the electromagnetic synchronizer is seriously affected. The data in Table 6 summarize results of tests made

(*Concluded on page 30*)

Some Notes on Negative Developers Fine-Grain and Otherwise

BY HENRY M. LESTER *

UNLIKE paint, the photographic emulsion does not even begin its useful existence when it is evenly spread upon its support. The hue or shade of its usually creamy color is just incidental to its appearance, and is seldom indicative of its type, purpose for which it was designed and performance characteristics. Differing from one another greatly in their internal structure as well as properties, hundreds of types of photographic emulsions are available today. Their great number is the result of highly developed specialization in their ultimate application: each being especially *mixed* and *manufactured* to meet definite requirements of the industry. The average photographer seldom realizes that in addition to those many types of film he sees lined up on well-stocked shelves of his photographic store—there are a great many others available today, which he may never have heard of. To mention just a few, he would be surprised to learn that there are many special types of emulsions available for use in astronomy, graphic arts, aerial photography, spectroscopy, etc. As an example, the list of emulsion types available in Eastman Spectroscopic plates includes 19 different types of sensitizing and 6 degrees of contrast.

Serious photographic workers recognize the fact that the preparation of a modern photographic emulsion is an achievement quite comparable in its importance and difficulty of accomplishment to that of constructing a fine camera or lens. A new emulsion is as salable as any other invention, and a good one just as hard to find. But the emulsion, be it ever so perfect, in itself is of little practical value to the photographer. He must be able, by careful manipulation and handling of it, by exposing and processing it correctly to bring out those very qualities and properties which were so thoughtfully incorporated in the emulsion's design. Thus, the emulsion is placed in the photographer's hands with significant recommendations for proper storage, loading, exposure, color-filtering, development and any special handling which, if followed, will help to produce results for which the particular photo-sensitive material was originally designed.

The photographer is entitled to know all there is to know about the performance of a photographic emulsion. The vast amount of data obtained by physical, chemical and sensitometric tests must be translated for him into practical terms of handling, exposing and processing of the film or plate so that it will perform in his hands in a fully *predictable manner*. To be able to do this the photographer should have such data on his emulsions as: its effective sensitivity to light; its relative response to various colors of light; its filter factors; its "toe," "shoulder" and "straight line" characteristics, indicative of its latitude, range of contrast available, and of course, development and other processing recommendations.

Only the uninitiated would wonder why, since most photographic emulsions consists substantially of some silver salts suspended in gelatin, some *one* developer would not suffice and be found adequate for processing of them all. The fact is that practically any standard developer would actually develop almost any photographic emulsion. But the answer to this question is that, while most of the emulsion's characteristics are built into it, they are actually brought out into their useful existence by a suitable coordination of exposure and processing, an aspect of its excellence and broad usefulness which allows extensive control and modifications of their various features. Thus, when properly processed an emulsion performs as intended. A fine portrait film will fail to yield that fine gradation of tone values should it be developed in a caustic, high-contrast developer. Similarly a negative of some line-drawings would fall short of its purpose, were it processed in a low-energy solution intended for development of fine-grain work.

Obviously the availability of many types of emulsions justifies the existence of a great number of developers specifically recommended for use with one or more of them. It is interesting to note that some of the developers are recommended for the processing of several types of emulsions; and that there are many emulsions for which more than one developer is recommended for securing different results. This is interesting because it shows us how finely balanced is the structure of the emulsion, and how responsive and adjustable it is to action of a developer. Thus one developer may be recommended for a given emulsion because of the brevity of its required immersion time, another for fineness of grain, a third for the extremely high contrast it is able to produce, and still another for its ability to produce a very high effective emulsion speed—all in connection with the same emulsion. A judicious selection of a combination of emulsion and developer, based upon thorough knowledge of each and their functional relationship to each other will produce the desired results. This provides an almost endless variety of possible combinations -frequently more than adequate to cover our needs.

The Eastman Kodak Company publishes some fifty to sixty standard developer formulas recommended for processing of their negative materials. This does not include many of their special formulas, not published, but furnished on request, and intended for processing of their special materials not generally available to the public but confined to use in certain industrial or scientific

* Member Photographic Society of America; Morgan and Lester, New York, N. Y.

fields. Agfa Ansco, Defender, DuPont and others also list impressive formularies of procedures recommended by them for processing of their products. And though careful comparison of many of these formulas may disclose only slight differences between them—these slight differences become quite significant in the light of the effect they seem to have on the various emulsions.

Most photographers seem to agree that a negative developer is only as good as is the available information on its performance with the individual negative emulsions. An unfamiliar concoction is not even considered satisfactory for development by " inspection." Constantly growing use of high-speed panchromatic materials and the demand for greater accuracy in photographic work brought about the increasing popularity of the time-and-temperature method of negative processing. With this growth came the demand for more and better information on the performance of developers with specified emulsions. This demand is being gradually gratified by producers of negative materials, who realize that this is a wholesome and mutually beneficial tendency, responsible for greater accuracy and a closer approach to negatives of constant quality.

Undismayed by the availability of so many " open " and recommended developers—possibly encouraged by the fact that accurate performance data were not available for all of these—a great many developers of a proprietary nature were offered to the public during the past few years. The public, misled by misplaced emphasis put upon developers used by successful photographers, " went for these in a big way," only to realize later that the " priceless ingredient " was not in the bottle but in that successful photographer's knowledge of how to coordinate the various factors, which add up to make a quality negative.

Like " the ships that pass in the night "—a long procession of proprietary negative developers went past us recently. They sailed in upon crests of waves of printer's ink used in announcing and publishing their arrival, their cure-all properties, their glorified sponsors and " famous " users . . . and sailed away, leaving behind them a wake of printer's ink again, but this time used to discredit most of the claims made for them. Their names? Most of them are by now deservedly forgotten. Many of these names will be found in a series of articles which appeared in *Photographing Retailing,* in most issues between September 1939 and May 1940 under the general heading " What Every Salesman Should Know." In those articles many of the fantastic claims made for these developers were properly evaluated and substantially discredited. It is impossible to quote here even a fraction of the miraculous properties claimed, but here are just a few: " . . . develops all films regardless of emulsion speed at one time and one temperature . . . will develop as long as there is sufficient solution to cover the film . . . imparts three dimensional effects . . . enables the novice to achieve professional results . . . is the first new great contribution to the art of film developing in more than fifty years . . . resolving power of emulsion is increased approximately three times . . . displaces all of the obsolete chemical developers . . . permits exposure at five times normal Weston speed . . . increases emulsion speed up to *fifty times* film manufacturer's rating . . . never becomes exhausted . . . is five times finer than other fine grain developers."

The existences of most of these concoctions were inevitably short-lived, because (1) most of them obviously lacked scientific background and were completely isolated from the knowledge of the structure of negative emulsions and photo-chemistry of developers, (2) they were defeated by their claims to " universality," " infinite life " and performance at variance with accepted principles of chemistry, sensitometry and sometimes even those of optics (claims for greater sharpness, depth of focus, resolving power, etc.), (3) while most of them would actually develop negative material, little if any information could be obtained on their actual and verifiable characteristics of performance in connection with specified negative emulsion (some of them stated in print: " Development Time: As long as it takes to smoke a cigarette! ").

There are some notable exceptions among those products. When, if and as photo-historians will be making an impartial evaluation of the various contributions to photography made during the last decade, several of these will be mentioned. Among them will undoubtedly be found the product invented by Harold Harvey, a negative developer intended specifically for fine-grain work, the production of which was taken over by the Defender Photo Supply Company under the trade name of Panthermic 777. This developer, though of undisclosed content, is considered by many workers a substantial and original contribution to the science of photographic negative development. It is fortunate that its manufacture, production, control, and distribution was assumed by an organization with a solid background of experience in the field of photosensitive materials. Quite apart from its intrinsic merits and the fact that its performance meets the claims made for it, the developer is provided with a set of data on its continuous performance characteristics with popularly employed modern emulsions at the full useful range of temperatures, and for the complete range of contrast available for each emulsion. These data, being accurate and dependable, yield results closely approximating stated values.

The definite trend among serious photographers to work along the lines of greater predictability or results prompted most manufacturers of photographic emulsions to turn on a flow of valuable product information from their files to the public. Eastman Kodak Company released during the past twelve-month period, a series of so called " Data Books " on their sensitized materials which offer in a condensed, mostly tabulated form, such specific information as: general properties, speed and recommended meter settings, color sensitivity, filter factors, daylight exposure tables, photoflood exposure tables, photoflash exposure tables, contrast achievable, recommended development, sensitometric curves, time-temperature development curves, graininess, resolving power, fixing recommendations, safelight recommendations, types of film or plates upon which a given emulsion is available.

Agfa Ansco, Defender and DuPont have also published and made available to photographers valuable data booklets for the users of their products. This wealth of information would never have appeared in printed form, say five or ten years ago. It is hoped that more of this specific information will reach the photographic public either through manufacturers' data sheets or booklets, or through releasing such information to periodical publications, similar in scope and importance to the sensitometric data recently released by Agfa Ansco for publication in *Photo Technique* Magazine (June 1940).

The desire for information on development of film to a specified gamma is justified not only by the prevailing tendency to avoid hit-and-miss procedures. It is considerably deeper than that. The term " gamma " is a much abused expression. It is frequently the object of jokes and ridicule especially in the photographic literature of the popular level. Mostly it is laughed at when not fully understood as to its true meaning and application. Some " experts " do not hesitate to diagnose the gamma value of a negative to the second decimal point merely by looking at a negative. It is important to realize that " gamma " is almost as much a unit of measure of photographic contrast as " degrees Fahrenheit " or " degrees Centigrade " are measures of temperature, or a " gram " a measure of weight. As such it may often be disregarded just as often as it is practical to determine the temperature of a solution by " feel " or to prepare developer by throwing in a " handful of carbonate " or a " pinch of bromide." Experience in matters of such nature is never a substitute for actual knowledge. It can only be an expedient based upon uninterrupted continuance within a limited field. Outside of this field its benefits are definitely and sadly unavailable.

To follow through all advice and information coming to him from research and sensitometric laboratories a photographer must learn to reconcile these various angles in actual practice and know how to interpret correctly the manner of specific sensitometric curves and data. Sensitometric data are completely useful only when the curves are plotted upon regular graph-paper and when they are accompanied by respective time-gamma curves for each film-developer combination. It is important that more people realize the simple distinction between such terms as contrast and density, the former being a function of development, while the latter *is* a function of exposure.

The problem of developing suitably exposed negatives to a definite contrast resolves itself into two main parts. The first is that which affects the decision on the part of the photographer to what contrast a negative is to be developed. The other is the method which would enable him to achieve that contrast by the time-gamma-temperature development with his chosen film-developer combination. The solution to the first problem was interestingly approached by Harvey Rockwell, Jr. in his excellent paper " Exposure Makes the Picture " * in

* J. Phot. Soc. Amer., Vol. IV, p. 13, Fall and Winter, 1938.

SCENE BRIGHTNESS RANGE

GAMMA OF DEVELOPMENT	4	8	16	32	64	128	256
0.4	0.24	0.36	0.48	4 / 0.60	3 / 0.72	3 / 0.84	2 / 0.96
0.5	0.30	0.45	4 / 0.60	3 / 0.75	2 / 0.90	2 / 1.05	1 / 1.20
0.6	0.36	0.54	3 / 0.72	2 / 0.90	2 / 1.08	1 / 1.26	1.44
0.7	0.42	4 / 0.63	3 / 0.84	2 / 1.05	1 / 1.26	1.47	1.68
0.8	0.48	3 / 0.72	2 / 0.96	1 / 1.20	1.44	1.68	1.92
0.9	0.54	3 / 0.81	2 / 1.08	1 / 1.35	1.62	1.89	2.16
1.0	4 / 0.60	2 / 0.90	1 / 1.20	1.50	1.80	2.10	2.40
1.1	4 / 0.66	2 / 0.99	1 / 1.32	1.65	1.98	2.31	2.64
1.2	3 / 0.72	2 / 1.08	1.44	1.80	2.16	2.52	2.88
1.3	3 / 0.78	1 / 1.17	1.56	1.95	2.34	2.73	3.12

Figure 1. Negative Density Range.

which he suggested a workable method of how to determine the gamma or contrast to which a negative is to be developed. He suggested that the brightness range of the scene be measured by means of an exposure meter, and that the negative density range be *predicted* on the basis of a definite relationship between the brightness range of the scene and the reflectivity or tone range of certain grades of paper. Rockwell's table (fig. 1) offers a simple way to secure the first part of the desired information. Thus, if, for instance, the scene brightness range is 1 to 64 we find that to reproduce that on No. 2 paper, the scene should be developed to a gamma of 0.5 or 0.6. If it were to be printed on No. 1 paper, it should be developed to a gamma of 0.7. There are also other ways of determining in advance the gamma to which a negative should be developed for the purpose of securing negatives of a constant quality which will yield fullest range of tones on paper. However as we are primarily concerned here with *predictable performance* of developers, we only wish to establish the fact that predictability of a gamma in the development of a negative is important and desirable.

The second part of the problem can be solved in a manner suggested in the *Photo-Lab-Index* * which to date contains over 200 graphs known as Time-Gamma-Temperature development charts applying to specific film-developer combinations. Each of these charts offers one or more curves plotted upon semi-log reseau, the horizontal coordinate of which indicates time intervals in minutes, while the vertical coordinate indicates temperature of solution. Recommended development time at a given temperature (within a recommended range) will be found along the lower horizontal minute line, by extending to it a vertical line from the intersection of the heavy gamma curve with the horizontal temperature line. While the time indicated is approximate only, it represents a mean value obtainable under average conditions and processing. However, it has been found in actual practice that these data are accurate and dependable and yield results closely approximating stated values. The length of each curve is confined to practical limits of temperature applying to the given developer. Each development time recommended in the table yields a certain contrast.

* Morgan & Lester, New York, 1939.

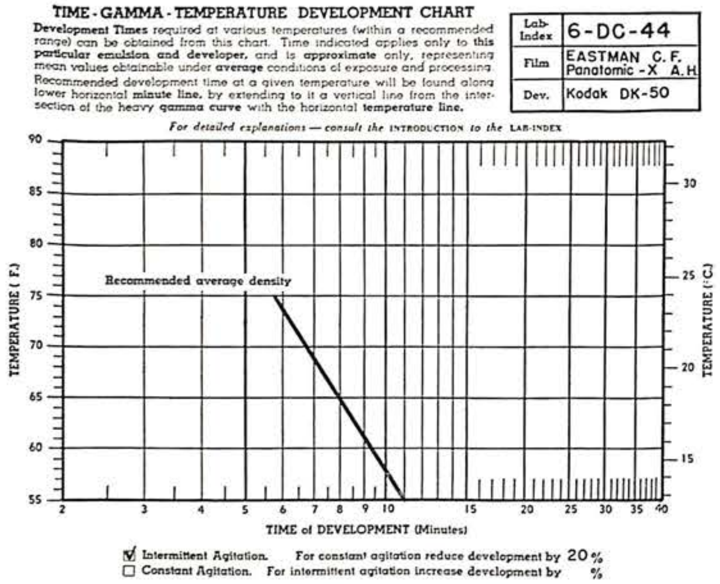


Figure 2. Copyright 1939 by Morgan & Lester

One of these time-gamma development charts is reproduced herewith (fig. 2), specifically applying to the recommended development of Eastman Panatomic-X sheet film in Kodak DK-50 developer. From it, it appears that if gamma 0.6 is desired it can be obtained by developing Eastman Panatomic-X sheet film in DK-50 developer for 4½ minutes at 65° F. with intermittent agitation of once every two minutes. Other gammas at other temperatures (within the recommended range) are just as easily gleaned from this chart.

It is obvious that predetermined contrast of individual exposures is practical only in connection with individually developed negatives such as sheet film, plates or film packs. In the instance of roll films, exposures and development must be suitably adjusted to each other to allow development to a gamma more or less normal for the entire roll film. It should be remembered that developer characteristics must be definitely known, especially those which influence the effective emulsion speed of the film used. Disregarding this will frequently result in what is known as "false gamma" values. This brings home another point in favor of using recommended development procedures. Film speed ratings are based upon their being processed in developers recommended (or other known equal) by the respective film producer.

This, however, should not be understood as implying that a film speed rating is a thoroughly fixed value, deviations from which are impossible. On the contrary, film speed values represent ratings of emulsion applying to the "*average recommended contrast.*" Thus, for instance, the basis for rating a given portrait film at 64 Weston in tungsten light is its average recommended contrast of 0.9. Should the brightness range of scene, or other considerations, require a gamma different than that representing the average recommended contrast, a change of its rating can be made by modifying the exposure as well as the development time, to achieve that different contrast. Such a change of 0.1 in gamma value can be compensated by a "step" in the Weston exposure meter scale. Should a gamma value higher or lower than that recommended be desired, an adjustment in the film speed rating can easily be made. Thus if a 64 Weston rating applies to the recommended gamma of 0.9 it could be assumed to be 50 to produce a gamma 0.8, or 80 to produce a gamma of 1.0.

It is hoped that if, when and as further standardization will be accomplished in the methods of measurement of sensitometric properties of emulsions in connection with developer performance, that it will become a standard practice to identify a given developer in some manner with its properties which affect the effective emulsion speed value. Thus, for instance, if a certain developer of a metol-borax type, such as Agfa 17, or Defender 6-D, or Eastman Kodak D-76 should be accepted as standard for producing full effective emulsion speed in a given film, which may be referred to as unity (say 100), then other developers might be rated as producing a relative emulsion speed based upon their actual performance. In this manner a developer "X" should have a relative speed rating of 67 per cent; developer "Y" say 54 per cent, and developer "Z" say 48 per cent. These ratings, of course, would have to be specific in referring in each and every instance to a definite film. Practical experience indicates that while a certain developer produces in one film a relative emulsion speed of 58 per cent of normal, it will produce a relative emulsion speed of 67 per cent of normal in connection with another film.

No matter how the problem of producing quality negatives is approached, it must be based upon definite knowledge of materials employed and developers used. It could hardly be solved with developers of unknown or erratic performance characteristics. Much work is being done along the lines of investigation of the functional relationship existing between choice of film, its exposure, choice of developer and its performance in connection with the various purposes for which negatives may be intended.

PHOTOFLASH LAMPS

(Concluded from page 26)

with a professional-type synchronizer having a coil resistance of 1.5 ohms. One lamp was used at the gun in each case. The other lamps, connected in parallel, had resistance in each lamp circuit equal to the resistance of ten or twenty-five feet of #18 lamp cord. The synchronizer was set to center at 20 milliseconds, the opening of the Compur shutter on a 4 x 5-inch Speed Graphic camera when one lamp was used.

Under the conditions indicated in the table, both the lag of the lamp and the time to shutter opening were increased, but the synchronization of the wire-filled lamps with the shutter was still satisfactory. When twenty-five feet of #18 cord was used with the #21 lamp, however, the lamp timing became both erratic and slow.

The resistance of the coils used on the various electromagnetic synchronizers varies from about 0.4 to 2.0 ohms. The low resistance coils draw more current from the battery than does the lamp. When an 0.5 ohm coil was operated on three new type D cells, the time lag of the lamp in parallel with the coil was increased one to two milliseconds. Coils having resistances of 1.0, 1.5, and 2.0 ohms had but little effect on lamp timing under similar conditions.

An Historical Sketch on the Founding of the P.S.A.

By BYRON H. CHATTO *

IT is well for an individual or an organization to occasionally look at the past, for our hope of progress can be best judged in contemplation of the paths that are behind us. Such a backward glance for the Photographic Society of America was attempted in an historical sketch published in *The Camera* magazine in January 1935, and reprinted in Volume I, Number 1 of THE JOURNAL in March of that year. Now that THE JOURNAL has many readers who have become associated with the Society during the past four years, the editor has suggested that another look at the origin and background of the Society will be of interest.

Although a number of those who were active in the Associated Camera Clubs of America are no longer with us, we are fortunate in having the founder of the A. C. C. of A. and many of his early asscoiates still active on our rolls. At the beginning of 1919 all previous organizations of camera clubs that could be considered national in scope had ceased to function, and the need for a means of communication and cooperation among clubs throughout the country was being felt. The initiative for the founding of a new organization was taken at the Newark Camera Club; and the major credit for the creation and success of the Associated Camera Clubs belongs to Louis F. Bucher, at that time secretary of the Newark Camera Club.

The first official paper of our Society is a letter under date of March 1, 1919 signed by Mr. Bucher and addressed to the officers of a number of clubs suggesting that they join in the formation of an association of clubs for mutual benefit.

Twenty-two clubs responded and were enrolled as charter members in what was to become known as *The Associated Camera Clubs of America*. The original twenty-two clubs were:

- Boston Y. M. C. U. Camera Club, Boston, Mass.
- California Camera Club of San Francisco, Calif.
- Chicago Camera Club, Chicago, Ill.
- Cleveland Photographic Society of Cleveland, Ohio.
- Columbia Photographic Society, Philadelphia, Pa.
- Dartmouth Camera Club of Hanover, N. H.
- Elysian Camera Club of Hoboken, N. J.
- Grand Rapids Camera Club of Grand Rapids, Mich.
- Kansas City Camera Club, Kansas City, Mo.
- Newark Camera Club of Newark, N. J.
- New Britain Camera Club, New Britain, Conn.
- New Haven Camera Club of New Haven, Conn.
- Orange Camera Club of East Orange, N. J.
- Oregon Camera Club, Portland, Ore.
- Overseas Camera Club of Detroit, Mich.
- Photographic Society of Philadelphia, Pa.
- Portland Camera Club, Portland, Maine.
- Southern California Camera Club, Los Angeles, Calif.
- St. Louis Camera Club, St. Louis, Mo.
- The Camera Club of Waterbury, Conn.
- The Photographic Club of Baltimore, Md.
- Yonkers Camera Club of Yonkers, N. Y.

Organization was rapidly effected and the first election of officers was held in October, 1920. It is interesting to note that most of these clubs have been in continuous operation ever since, and that more than half of them are now active in the Photographic Society of America.

The first activities of the associated clubs included the assembly and distribution of a Print Interchange and a Lantern Slide Interchange among the member clubs. A feature provision from the beginning was the guest privilege courtesy extended to any member of an affiliated club by any other club for a reasonable length of time. Realizing that the activities of such a national organization would wisely include encouragement of new club formation, Mr. Bucher prepared the text of a booklet entitled *The Camera Club—Its Organization and Management*, which was first published in 1920 by the association, the cost of printing being contributed by The Eastman Kodak Company. This booklet has gone through three revisions and many hundreds have been distributed on application to groups interested in starting a club. The third edition, revised by R. L. van Oosting, was published by the Photographic Society of America in 1936 and is still available from the Secretary.

The early years of the Associated Camera Clubs of America as an organization was not marked by any spectacular achievements. However, slowly but surely, the movement gained momentum and became truly representative of amateur photography in organized club form throughout the United States and Canada. The 50-mark in club affiliations was reached in 1933, largely through the efforts of Mr. R. L. van Oosting, who served as secretary of the A. C. C. of A. for the years 1932 and 1933, and later became vice president of the P.S.A. and editor of THE JOURNAL until his death.

Many names of individuals who have contributed much to the advancement of the Associated Camera Clubs movement could be given, such as those of Julius Cindrich, Ralph D. Hartman, W. L. Woodburn, Ralph Bonwit, Dr. E. P. Wightman, Dr. Max Thorek, and others. To give proper credit to all is impossible here.

It seems rather impossible to record just who first conceived the idea of a national photographic society. Per-

* Honorary Member of the Photographic Society of America, first Secretary, and Past Secretary-Treasurer

haps the best statement on that subject might be taken intact from the April, 1934 issue of the P.S.A. Bulletin where Louis F. Bucher wrote:

"To say who was the originator of the thought that there should be a national photographic society in America, designed along lines similar to those of the Royal Photographic Society of Great Britain but especially planned to meet the needs of photographers in the United States and Canada, is more than I care to undertake. For various reasons, past attempts to form such a society have not been successful. The first obstacle was the vastness of the territory to be covered. However, speedy communication and transportation have brought the East and West Coasts, Canada and Mexico, really closer to each other. This, together with the ever-persistent urge that the Americas have a photographic society within the borders of this continent, may have prompted Sigismund Blumann (then Editor of *Camera Craft*) to again bring the subject to the fore. Later, the idea was again proposed in September, 1932, when Dr. Max Thorek, F.R.P.S., of Chicago, visited the Newark Camera Club and a dinner in his honor brought together Ira Wright Martin, President of the Pictorial Photographers of America; Wm. A. Alcock, F.R.P.S., Wm. L. Woodburn, the writer, and others."

We may record here that the outcome of this dinner and its accompanying merging of minds in conference was the formation of a temporary committee with Louis F. Bucher as Chairman; he to enlist the services of others to organize a committee which would be truly representative of the country's mind. A committee with about one hundred members was formed, with sub-committees to function within their designated scope, and this group carried on the work until the Associated Camera Clubs of America, now representing about fifty member clubs, voted within their organization to change their own organization name to that of The Photographic Society of America and to take over the responsibilities carried thus far by the general organization. This final action was taken in December, 1933, but much preliminary work had been done before that date. In September, 1933, a general meeting of the organization committee was held in Chicago in the rooms of the Fort Dearborn Camera Club. It was officially decided to authorize the organization committee to enroll individual members and to record the first one hundred enrollments as Charter Members of the P. S. A. In the following month, October, 1933, Louis F. Bucher presented a resolution to the Board of Directors of the A. C. C. of A., which, upon its adoption by the several member clubs, brought about the following changes in the Associated Camera Clubs of America:

(1) Its name was changed to read "The Photographic Society of America."

(2) The organization committee and its sub-committee were authorized to prepare and submit a new constitution which would provide for the enrollment of individual members and include other changes made necessary by the increased scope of the new Society.

Upon adoption of this resolution in December, 1933, the organization committee transferred all its records and funds on hand to the officers of the now duly organized Photographic Society of America.

Upon the reorganization the following officers and directors, who had been elected by the Associated Camera Clubs, became the officers of the Photographic Society of America.

Dr. Max Thorek, F.R.P.S., President
R. L. van Oosting, Vice-President
B. H. Chatto, Secretary
Chester W. Wheeler, Treasurer

DIRECTORS
William A. Alcock, F.R.P.S.
Charles K. Archer
Robert A. Barrows
Harry W. Greene
Arthur Hammond
Harry P. Herron
William L. Woodburn

At the time of the adoption of the first Constitution and By-laws, March 1935, the Society listed 62 member clubs and about one hundred and fifty individual members. The first constitution had been drafted with the idea that the member clubs and the individual members would each have equal standing in the Society.

At the Chicago convention in 1937 the idea was expressed that certain features of the By-laws should be revised to permit taking into the Society those regional organizations of clubs which had come into being in some parts of the country, permitting them to retain their own organization and at the same time become affiliated with the Society. The result of the action authorized at that time has been a complete change in the form of organization, so that now all clubs have their relation to the Society through one of the affiliated associations.

In 1937 the Society was incorporated in the State of Illinois, with its purpose defined as follows:

The objects of the Society shall be: Promotion of the art and science of photography in all its various branches, through individual memberships, associated camera clubs and other photographic organizations, research and dissemination of photographic knowledge, and promotion of photographic salons and exhibitions.

Looking back to the early years of the Associated Camera Clubs of America we find a very different photographic industry than that which exists today; no one would have had the courage to imagine the remarkable growth of photography as an industry and as an avocation. At that time the magazines in American devoted to photography could be counted on the fingers of one hand and the publication of a new book on photography was a rare event. International salons of photography were held in only six or eight American cities. To be completely equipped one bought a 4" x 5" plate camera and a tripod, anastigmat lens (f/6.3) and a yellow filter. Members of camera clubs aspired to be pictorialists, and to have a picture accepted by one of the international salons placed one in a position to be looked up to by all of his associates.

Contrast those conditions with those that exist today, when photography is a billion dollar industry, and consider the opportunity that confronts the Photographic Society of America to serve the thousands of serious minded photographers, both amateur and professional.

The Report of the President

By FRANK LIUNI

IT will be a pleasure to extend a most cordial welcome to all attending the Society's Sixth Annual Convention. The General Committee, headed by Mr. Edward J. Ryan as Chairman, and our good friends of the Cleveland Photographic Society, have labored hard for a year and have done a marvelous job. They have presented us with a program studded with some of the brightest luminaries of the photographic firmament—Dr. J. I. Crabtree, Adolf Fassbender, Dr. L. A. Jones, Keith Henney, T. J. Maloney, R. S. Potter, Helene Sanders, Valentino Sarra, Dr. Max Thorek, and others:—what fan's mouth does not water at the mere mention of such fare? We are indebted to Dr. E. P. Wightman for it. Many others of prominence who are not on the program are in attendance.

The Society serves a vast area and it is impossible for any member to become acquainted with very many other members. Our conventions perform a vital service in providing such an occasion to strengthen the bonds which bind us together in our pursuit of a common goal. I am sure all will join me in extending our most hearty thanks to those who have contributed toward making this Convention the best ever.

It is appropriate that we pause to take stock of the gains of the past year and of the problems which still confront us. A year ago our most pressing need was more members. The following tabulation gives the story of our success:

	October, 1939	October, 1940	*Goal January 1, 1941*
Individual members	285	675	1,000
Sustaining members	20	33	100
Affiliated Assoc. members	5	10	10
Clubs in the General Association of Camera Clubs	122	180	200
Total number of clubs affiliated with the Society	251	410	...

While these results are very gratifying and have improved the prestige and financial standing of the Society, we are still far from the goals which were set at the beginning of the year. Even if these goals are attained we must not assume that they are adequate. A great many more members will be required if the Society is to function as it should—particularly individual and sustaining members. At the earliest possible date the Society should have 5000 individual members and a minimum of 2500 of these must be enrolled by the end of 1941. It will take plenty of hard work to do this but it can be done. This still remains Problem No. 1.

The Treasurer on another page has given us the story of the Society's finances for the year. While the report shows a tremendous improvement, we must not lose sight of the fact that the funds in hand will maintain our present activities until the end of the year only if the utmost care is exercised and only if the officers of the Society continue to carry a heavy burden of petty clerical work.

A third matter intimately related to the increase in membership and the resulting financial strength is the establishment of a headquarters with a paid staff. The work of the Society has always been carried on by its Officers and Committee Chairmen who themselves have done the filing and other routine clerical work as well as handling the correspondence. With the considerable increase in membership and activities there has been a tremendous increase in this work. The officers are busy people with limited time to devote to the Society's affairs. In the past two years the volume of business has taxed them to the limit. Your President and Secretary have ceased to do photography and, indeed, have had time for very little else. For the past six months your Secretary has been out of a job and has devoted an average of twelve hours per day seven days a week to the Society's business. This fact alone has enabled us to keep abreast of it.

This condition cannot long endure. The volume of business is still rising and it will continue to increase. The Secretary will shortly be obliged to turn his attention to his own personal affairs. The other officers must have relief. The situation represents a crisis. Without a staff and office to lift the clerical burden from the officers, the forward progress of the Society will be impeded if not stopped, yet we are not now in a financial position to establish a headquarters. *What is needed is the immediate gift of several thousand dollars to permit the opening of the headquarters at once. We trust that generous donors will come forward.*

A real need of the Society has been adequate publicity. The past year has seen a marked improvement in the quality and the volume of publicity. The credit for this must be given almost entirely to Mr. Quellmalz. It is safe to say that the Society has received more publicity during the past year than in all the rest of its existence. The high level must be maintained and increased. Every member, and especially the Affiliated Clubs, can assist in this effort. We cannot expect people to join the Society if they do not know of its activities and purposes and the results it is accomplishing.

During the first two years of my administration the problem of organization was uppermost. I believe this problem has been largely solved. The set-up of the Society is a workable one and well suited to a country as large as ours. With this problem out of the way, our efforts this past year have been directed to an expansion of activities. How well this program has progressed is evidenced by the number of Divisions. At the last Convention the Society had only the Technical Division. We have since added the Pictorial and Historical with a Color and Nature Division in the process of formation.

A great deal of work remains to be done to make these Divisions the powerful factors they should be. This task will be one of our main concerns during the coming year. The fact that so many distinguished men have accepted posts on the Committees for these Divisions speaks well for our start. The Pictorial Division Committee has presented a separate report. Chairman John P. Mudd and Secretary J. S. Rowan have worked hard and have produced splendid results. The Society owes them and their Committee a vote of thanks.

It is appropriate to call your attention to THE JOURNAL. Its cost has been reduced and, at the same time, it has been vastly improved in every department. The very great amount of work involved has been done almost entirely by Mr. Quellmalz. Our efforts for further improvement will continue but any increase in the number of pages or in the number of issues will be dependent entirely on the success of the Membership Drive.

The Club Print Interchange is one of the oldest activities of its kind in the country, having been started by the Society's predecessor, the Associated Camera Clubs of America. Some years ago the Loan Exhibit Service was inaugurated as a companion service. Both of these activities were at their peak during the past year. One hundred eighty-seven clubs participated in the Interchange and 100 in the Loan Exhibit Service. It is apparent that these Services will be even more popular for the coming year. The amount of work which this involves is great. A total of 300 shows was required, aggregating 6000 prints. Two thousand six hundred ninety assignments of dates were necessary. The file of letter correspondence occupies about a foot and a half of file cabinet space in addition to many thousand post cards. Both of these services should be handled from the proposed Headquarters to increase their efficiency. The principal difficulties which were experienced were caused by the failure of a small percentage of the club print directors to read, understand and follow the instructions sent to them. It is a curious fact that while the percentage of cases in which shows failed to arrive on time was relatively small, certain clubs were the victims repeatedly, even though the club print director at fault in each case was different. Changes have been made in the method of handling these Services which it is hoped will minimize the number of such cases for this and coming seasons. One or two clubs were such bad offenders that it has been necessary to refuse them service as a protection to the other clubs.

The Society was selected by the New York World's Fair as the exclusive agency to handle all photographic activities and Mr. Quellmalz was appointed Photographic Director to serve without salary. This arrangement has been very advantageous to the Society. Mr. Quellmalz was provided with a large and completely equipped office and a full time paid assistant. The office has, in effect, been the Society's office. The Fair also provided a large, beautifully equipped and lighted space in the Hall of Industry and Metals at the Theme Center of the Fair for the display of photographs. Three hundred salon photographs of all types have been kept constantly on display, four thousand in all being used. In the Camera Club Salon six thousand prints were received and approximately fifteen hundred hung. All photographs were procured by the Society and all were displayed under the Society's auspices. Millions of persons viewed them and thereby learned about the Society.

In addition a weekly snapshot contest was held with over thirty thousand entries received. Special contests for twelve exhibitors were arranged with fifteen thousand additional entries. The Society received a large amount of newspaper publicity all over the country, including a number of full page rotogravure displays in some of the leading newspapers of the country. Mr. Quellmalz has put in long hours on this job and has done a great service to photography and to the Society. Among the members who have given him invaluable assistance, Mr. Robert Coope, Director of World's Fair Photographic Contests, deserves particular mention. Mr. Carlyle F. Trevelyan, the Chase Bank Camera Group and the Camera Society of the National City Bank Club also have given unselfishly and unstintingly of their time and labor.

The Continental Monthly Print Contest was launched last year and enjoyed a good season. Mr. A. J. Cunningham of the Utica Camera Club, won the Gold Medal and the Photocrats of Canton, Ohio, the Club Trophy. The Contest has been modified this season and is even more successful. A Club Monthly Trophy has been added which will be held for one month by the Club which scores the greatest number of points.

The success of our International Salon is demonstrated by the show hanging in the Cleveland Art Museum. Our experimental Petroleum Industry Salon will be hung in Chicago from November 9 to 15 and will be something a little different in the way of exhibitions. We believe that it will do a great deal to impress on the public the fact that photography is an indispensable tool in science and industry and can become an important adjunct in the daily life of the average person.

The question of granting Honors has for years been a subject of debate. This question was settled two years ago when directions were given to set up a system in the By-Laws. This has been done and the necessary procedure has been carried out. Elsewhere in this JOURNAL will be found the report of the Honors Committee after more than a year's work. It must be borne in mind in connection with the awards that strict limitations are placed around them by the By-Laws, particularly with regard to the number which can be bestowed in any year. The members of the Board have,

(Concluded on page 44)

Announcement of Honors

THE first group of Honors will be conferred on the following at the Annual Banquet on the evening of October 26:

HONORARY FELLOWS

William H. Jackson, New York City
Dr. C. E. K. Mees, Rochester, New York
Alfred Stieglitz, New York City

HONORARY MEMBERS

William A. Alcock, Brooklyn, New York
Louis Fleckenstein, Long Beach, California

FELLOWS

Edward Alenius, Basking Ridge, N. J.
Dr. John I. Crabtree, Rochester, New York
Adolf Fassbender, New York City
Frank R. Fraprie, Boston, Mass.
J. Ghislain Lootens, New York City
C. B. Neblette, Rochester, New York
Dr. D. J. Ruzicka, Jackson Heights, New York
Dr. Max Thorek, Chicago, Illinois
Dr. E. P. Wightman, Rochester, New York
William H. Zerbe, Richmond Hill, New York

ASSOCIATES

Hillary G. Bailey, Indianapolis, Indiana
Rowena Brownell, Providence, Rhode Island
Dr. David R. Craig, Washington, D. C.
Clare J. Crary, Warren, Pa.
H. Richardson Cremer, Upper Montclair, New Jersey
Eleanor Parke Custis, Washington, D. C.
Alfred A. De Lardi, Philadelphia, Pa.
Richard T. Dooner, Philadelphia, Pa.
John Forrest, Binghamton, New York
Paul Linwood Gittings, Houston, Texas
Arthur Hammond, Boston, Mass.
Nicholas Haz, New York, N. Y.
Franklin I. Jordan, Newton Highlands, Mass.
Dr. Theron W. Kilmer, New York, N. Y.
Sophie L. Lauffer, Massapequa, N. Y.
Don Loving, Evanston, Illinois
John W. McFarlane, Rochester, N. Y.
John P. Mudd, Philadelphia, Pa.
Fred P. Peel, Chester, Pa.
Valentino Sarra, Chicago, Illinois
Dr. Maximilian Toch, New York, N. Y.
E. V. Wenzell, Philadelphia, Pa.

REPORT OF HONORS COMMITTEE

UPON the eve of the announcement of the first Honors list at the Convention, our Secretary has asked me to present a brief account of the method used in making the selections. Such an explanation appears desirable not only because some misconceptions on the subject exist in the minds of many members but also because the initial award of Honors bids fair to mark a new milestone in the Society's progress and prestige.

The By-Laws of the Society specifically govern the question of Honors. They were published in the January 1940 issue of the *Journal*. I shall quote some of the pertinent provisions:

"*Honorary Fellowship* (Hon. F.P.S.A.) may be conferred on any person whose position or accomplishments in any field of photography or in the allied arts or sciences shall be particularly outstanding. . . . The Board of Directors may elect not more than three Honorary Fellows in any calendar year."

"*Honorary Members* (Hon. P.S.A.) shall be persons who have rendered some distinguished service to the Society or to photography."

"*Fellowship* (F.P.S.A.) in the Society is open to those members who, in the opinion of the Board of Directors, have distinguished ability or originality in any branch of photography or of the arts or sciences related thereto. . . . Not more than 10 Fellows may be elected in any calendar year."

"*Associates* (A.P.S.A.) shall be those individuals who have been members for at least six months who in the opinion of the Honors Committee have ability above the average in either the technical or artistic side of any phase of photography or of the allied arts and sciences."

Five members of the Board of Directors comprise the Honors Committee. Since last April they have carried on a comprehensive exchange of views and have ascertained the opinions of all the other Directors. Each of the Directors was furnished with a list of members eligible for honors under the terms of the By-Laws. The nominees for the first Honors list were chosen entirely by the Board of Directors, most of its members having participated in the selections. In the future, any active member may suggest other members for Honors consideration. A printed form will be provided for this purpose. The Honors Committee will welcome assistance from all the membership in seeking out and recording the achievements of the talented workers whom we should consider for the next Honors list. No member, however, may apply for honors consideration on his own behalf. Candidates are not required to submit examples of their work. Members may be elected to Fellowships without first having been awarded Associateships.

Nominees for the first Honors list were divided as follows: Honorary Fellows, 5; Honorary Members, 5; Fellows, 43; Associates, 106. None of the present Directors were considered for the first selections. The nominees included exhibitors, technicians and research workers, publishers, editors, authors, teachers, illustrators and industrial leaders.

In September, our Secretary mailed ballots, containing the names of all the nominees, to the Directors for their final votes. The number of Associateships to be awarded in the first list was also decided by the same ballot.

There is little doubt that many worthy nominees will fail to be elected to Honors at the outset because of the numerical limitations imposed by the By-Laws and a desire on the part of the Board to pursue a conservative policy. However, failure to be included among the first selections increases the probability that a qualified candidate will be awarded Honors at the next election. If, when the Honors are announced, any grievous sins of omission appear to have been committed the membership can, I believe, trust the Directors to put them right at the first opportunity. To overdo the award of Honors at the very beginning would be to cheapen them and to render them empty.

I can confidently assure you that the Directors have undertaken their difficult task with all possible fairness. It is their purpose to make Honors in the Photographic Society of America the most prized Honors in the photographic world.

CHARLES B. PHELPS, JR.,
Chairman

The P.S.A. International Salon

A REVIEW

FIRST of this season's salons is the 389-print show of the Photographic Society of America, being shown at the Cleveland Museum of Art during the P.S.A. Convention. Neither so striking as some of last year's salons, nor so dull as a great many, the 1940 International Salon of the P.S.A. is meaty, well-balanced, easy to look at. There are few pictures of babies, and those that did get by the judges are good. There is some brilliant figure work, an attempt or two at surrealism, and much that simply falls under the general heading of " landscapes."

Probably the most obvious feature of the collection is the general high level of print quality. Of course this is as it should be—a salon such as this should show only the best photographic quality. Unfortunately this isn't always the case, and a show will lend more of its emphasis on subject matter.

Very evident from a viewing of this exhibition is the present trend toward larger prints. The day of the eleven-by-fourteen print as the ultimate in photographic production is now past. The eleven-fourteen is beginning to look like the eight-by-tens we used to see a few years ago—lost in the middle of the mount. It's still true that a few workers have been making sixteen-by-twenty prints for the last eight or ten years, but the general feeling among exhibitors during this period was that processing anything larger than an eleven-by-fourteen was somewhat in the same class as washing a blanket. Between one and two hundred of the 1711 prints submitted to the exhibition were made on fourteen-seventeen paper.

Anyone who sees the P.S.A. Salon will notice one other feature that is closely related to print size—the indication that some photographers are breaking the rigid traditions of symmetrical mounting and are striking out for themselves. Among the most effective treatments were those that employ bleeding two sides of the print off the edges of the mount, usually the left and top. One exhibitor extended his horizontal prints clear across the mount leaving space at the top and bottom. No doubt most of the conservatives will put thumbs down on mounting of this sort—but it can't be denied that it helps break up the deadly monotony of row after row of similar sized prints evenly centered on white mounting boards.

Another good device for breaking monotony is the toned print. Good toning makes a good print better, can't do much for a bad print and bad toning might better have been left undone. There's a lot of good toning in this P.S.A. show. There are many prints that are being exhibited because they've been toned with finesse without being too obvious about it. But a number of the prints that weren't accepted might easily have gotten by the 12 judges if they had been simply black-and-white prints. Entirely too large a percentage of prints submitted had been poorly toned. Dark portions were weak and sick-looking, and the highlights lacked the brilliance that's necessary to make an outstanding print.

Very often, after a salon has been judged, the exhibitor finds that the print he felt was his best—the print that had never been turned down—was not accepted. Sometimes the failure of acceptance seems rather mysterious when the photographer knows that his work is acceptable to most juries. In the case of this show, for example, rejection may not imply a lack of quality at all, but simply an application of the law of supply and demand. At least five photographs of the Lincoln Memorial were submitted to the judges, not to mention dozens of prints of cats and other animals. A judge is going to feel that acceptance of all these photographs, no matter how excellent, will throw the show off balance, and some exhibitor will miss out on his favorite water-lily print, even if it *was* hung in Pittsburgh.

From some of the work submitted it was obvious that the photographers weren't members of camera clubs, and probably were making their first stab at salon competition. Unmounted, weak both in quality and subject presentation, these prints were five-by-seven and eight-by-ten—thus counting two strikes on their acceptance possibilities right at the start.

Of the 389 prints accepted, nine came from Canada; four from China; two each from Honolulu, Mexico, Central America and Hungary; and one each from Portugal and Thailand (Siam). The Hungarian exhibitor sent two sets of prints by separate steamers in the hope that one set would miss the mines; both arrived safely.

JAMES HARVEY HEBB, Vice-Pres., Council of Camera Clubs, Philadelphia

THE JUDGING

THE judging of the P.S.A. International Salon is now over and it may be of interest to know how it was done. Owing to the prestige of this salon, we had no difficulty in securing twelve capable judges: Edward K. Alenius, Robert A. Barrows, Byron H. Chatto, David R. Craig, Alfred A. DeLardi, Adolf Fassbender, Frank R. Fraprie, Joseph G. Lootens, Fred P. Peel, Thomas O. Sheckell, Dever Timmons, William H. Zerbe. These twelve men were divided into four juries of three men each and seated before four of the new P.S.A. lighting standard easels.

The photographs had been previously divided into four piles, each pile containing only one of the contributor's prints so that on this first judging, each print was judged by an entirely different jury. On this first round, prints which received a unanimous vote from all three jurors were accepted for the salon and these totaled approximately 100, out of the more than 1700 prints received. Prints which received a favorable vote from one or two jurors were marked accordingly and put in a separate pile for further judging. Prints which received only unfavorable votes from the jurors were put in a temporary rejected pile.

On the second round, the piles of prints receiving one or two affirmative votes were run before a different jury so that a total of six judges passed on these prints, and those which received a total of four or five out of the total six were accepted for the salon. This accounted for approximately 125 additional prints.

Those prints receiving three votes or less were then run before the entire twelve jurors as a single jury and the votes were recorded. This also included the prints which received no votes on their first round, so that each print entered was viewed at least twice. The most controversial and the poorest prints received a concensus vote of twelve capable jurors.

The prints originally accepted received at least a 66⅔ per cent vote, so it was decided to accept prints receiving seven of twelve jurors votes making 58 per cent vote of the entire jury.

At this point the judges decided that, rather than have complimentary hanging of their own prints which in this case would necessitate the hanging of 48 prints, that it would be better to have the exhibitors' prints hung. It was also decided that since there was such a slight difference between six and seven votes of a twelve man jury, the quality of the salon would not be lowered by admitting those prints receiving six votes and this completed the show.

It was interesting to note that only a small number received better than seven votes, indicating that a capable three man jury is a safe proposition in judging a salon. It was also found that the new standardized lighting worked very satisfactorily even with twelve judges there being no glare even on the glossy prints. The judges unanimously approved of the amount of light and the general arrangement of the easel.

JOHN S. ROWAN

JUDGING PHOTOGRAPHS

THERE is a deep felt discontent with the way photographic salons have been judged, especially in the United States. A careful survey of the catalogs of international salons for many years has given me the impression that the important photographic salons held in continental cities from Copenhagen to Madrid and from Paris to Warsaw are usually judged by committees whose members have a breadth of culture and an artistic and technical training which makes their judgment more uniform and more deserving of respect than seems to be the case in the United States. The English shows are, as a rule, not well judged. The Royal Photographic Society does not have sufficient hanging space and accepts only two prints out of four submitted, no matter how meritorious. The judgment of the London Salon seems to be biased in a similar way, for while the Salon members as a rule have five or six prints each, outsiders rarely have more than two out of six accepted. In the other shows in England the judging varies from the hanging of all prints submitted and the awarding of prizes thereafter, through judgment by a single judge to selection by three competent judges, who are eminently fair in a number of cases and rather harsh in others.

In the United States almost all salons are judged by three judges, with five occasionally and one rarely. Distances are so great and traveling expenses so high that most salon committees have to select their judges within a radius of fifty miles or so, so we see on these juries successful local exhibitors, art teachers, professional and commercial photographers, and even local celebrities, whose knowledge of photography is not evident to the outsider, or even by the hanging of any of their prints. Outside of the larger cities, therefore, the judges usually have little artistic training and frequently a very prejudiced and biased judgment of photographs based mainly on personal likes and dislikes. Frequently, in view of the present sharp divisions of pictorial opinion, the committee will select one modernistic and one conservative photographer, in which case the show is usually made by the third member who frequently has no photographic experience at all.

It seems to be generally recognized that a three-man jury is not thoroughly satisfactory. Increasing the number to five increases the expense and still too frequently leaves the final decision to the unlucky fifth who hears two votes on each side. The selection of a single judge insures a consistent standard of judging, but few committees can find a single judge whose competence, artistically and photographically, is so well acknowledged as to cause no grumbling.

Mr. John S. Rowan of the Baltimore Camera Club proposed this spring a jury of six members for the Baltimore Salon, to be divided into two working juries of three members, each of which should judge half the prints. Their acceptances were to be left undisturbed, but their rejections were to be revised by the other jury.

The Photographic Society of America elaborated on this scheme to judge its first international salon. Twelve well known pictorialists were invited to serve on the jury and it was arranged that four juries of three should each pass on one-quarter of the prints with their unanimous acceptances to stand and the other prints to be reviewed by a second jury of three. I cannot conceive that it is fair to exhibitors that various portions of the submitted prints should be completely judged by juries who have not seen all of the prints. This sets up completely different standards of judging for various prints and various workers and it might easily happen that four first class prints might be rejected by four different sets of jurors with different standards. The original plans were altered so that all prints accepted and rejected were submitted to the entire jury of twelve members working as a whole. Each juror was provided with a paddle, black on one side, white on the other, which he held above his shoulder, showing white for acceptance and black for rejection. The result was a revelation to all present. In the first place, the voting by twelve jurors was much more rapid than that by three. With a three man jury each member feels that he has a casting vote and he works under much greater tension. This slows up the voting considerably and apparently many jurors pay much more attention to the votes of their associates and when having to decide a tie allow their judgment to be swayed by their sense of the competency of their associates or sometimes by a spirit of opposition. When twelve jurors are voting no man thinks that his vote is decisive. He is not able to let another's authority sway him effectively, and his judicial mind works more freely and evenly. He consequently looks at nothing but the print, makes his decision quickly and votes without hesitation.

From each of the original juries there came to the whole jury two piles of prints, one of which had received no votes, and one of which had received either one or two. These eight assortments came in no predetermined order, but did come before the jury in practically unbroken sequence. In several cases I knew where the separation of the piles came, and it was amazing to see how the jury responded to these divisions. The prints which had originally received no votes, as a rule, got less than three votes from the entire jury. The one and two prints jumped instantly to a jury vote of 5, 6, 7, and occasionally 8. The whole jury examined also the prints accepted by three votes of any one jury, or by four or five votes from the first two juries. None were rejected. It was at first decided that all prints which received seven votes by the full jury should be hung, but after some discussion it was resolved that no prints should be hung as honorary contributions from the twelve jurors, and this allowed the hanging of all prints which received six votes, or half of the jury.

Over four hundred prints were rejected by twelve votes and hundreds more with only a single or two assenting votes. It would seem to be apparent that these prints had very little merit, either pictorially or technically, and it seems doubtful that any other competent jury would ever hang many of these prints in the state in which they were submitted to this exhibition.

It would doubtless be impractical for most shows to import twelve jurors, but it seems to me, as a result of this experience, that a larger jury than three is desirable and that a jury of even numbers is preferable to one of odd numbers. The responsibility of having the casting vote is a serious handicap to many individuals. With four jurors, there will be five piles of prints, with six jurors there will be seven piles, and the division can easily be made at the point which hanging space dictates.

Such a jury, I think, should be entirely composed of photographers. During the past three years I have heard a considerable number of thoroughly competent painters, etchers and art teachers comment on photographic prints and talk to photographic clubs. In practically every case, even if they were sympathetic to photographic work, they showed a lack of understanding of photographic methods, possibilities and results, which totally incapacitates them to judge of the quality and success of a photograph. Not understanding the technique of photography, they overemphasized the importance of certain qualities which are inherent in photography, but technically difficult in hand-wrought mediums. It is true that technical deficiencies in photography may sometimes produce unintended results which seem praiseworthy to artists because difficult in their media, and the average artist's respect for a photographic print is by no means coincident with the judgment of a skilled photographer. On the other hand, it seems to me that the more advanced members of most camera clubs might well have a place on a large jury, even though not accomplished pictorial workers, for part of the essence of judging is the ability to see an art in the light of present-day tendencies Too much reliance should be placed neither upon conservative training, nor upon forward looking enthusiasm, but a jury should be balanced between possessors of both these qualities

FRANK R FRAPRIE

Recommended Lighting Easel

Designed By JOHN S. ROWAN, P.S.A.

Item	*Req'd*	
1	2	Top & Bottom Panels 17⅜" x 29½"—¼" Plywood
2	4	Side Panels—17⅜" x 12"—¼" Plywood
3	2	Front Panels—12" x 30"—¼" Plywood
4	1	Back Panel—29½" x 48"—¼" Plywood
5	14'	Back Panel Frame ¾" x 1½" Strips Frame—29½" x 48"
6	2	25 Watt Frosted Bulbs
7	2	40 Watt Frosted Bulbs
8	1	Easel Bottom ⅞" Sq. x 29" Taper as Shown
9		Easel Front ⅜" x 1¼" x 29"
10	4	Porcelain Sockets
11	20'	Wire
12	16'	¼ Round Moulding
13	4	Box Cleats for Back Frame
14	32	¾" #5 Rd. Hd. Brass Wood Screws & Washers
15	1	Plug-in Receptacle
16	2	Socket Support 3" x 27"—¼" Plywood
17	1 Box	1" Wire Brads

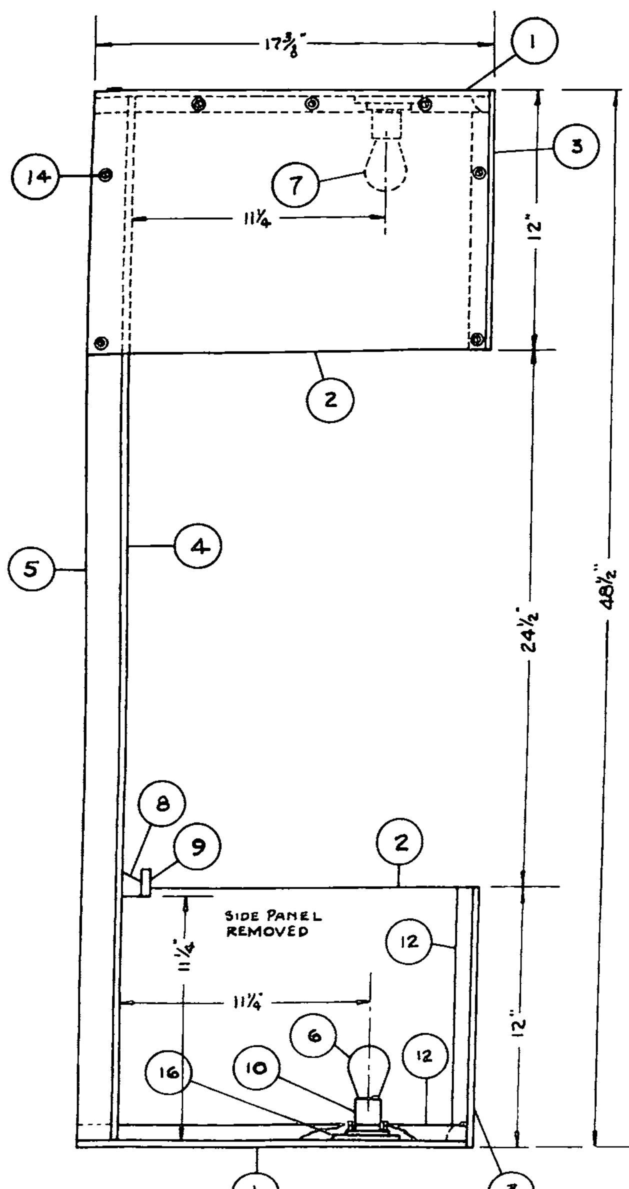
USE WIRE BRADS TO
- Assemble Socket Support
- Assemble Back Panel & Frame
- Assemble Easel & Back Panel
- Assemble Top & Front Panel
- Assemble Bottom & Front Panel
- Assemble ¼ Rd. Moulding

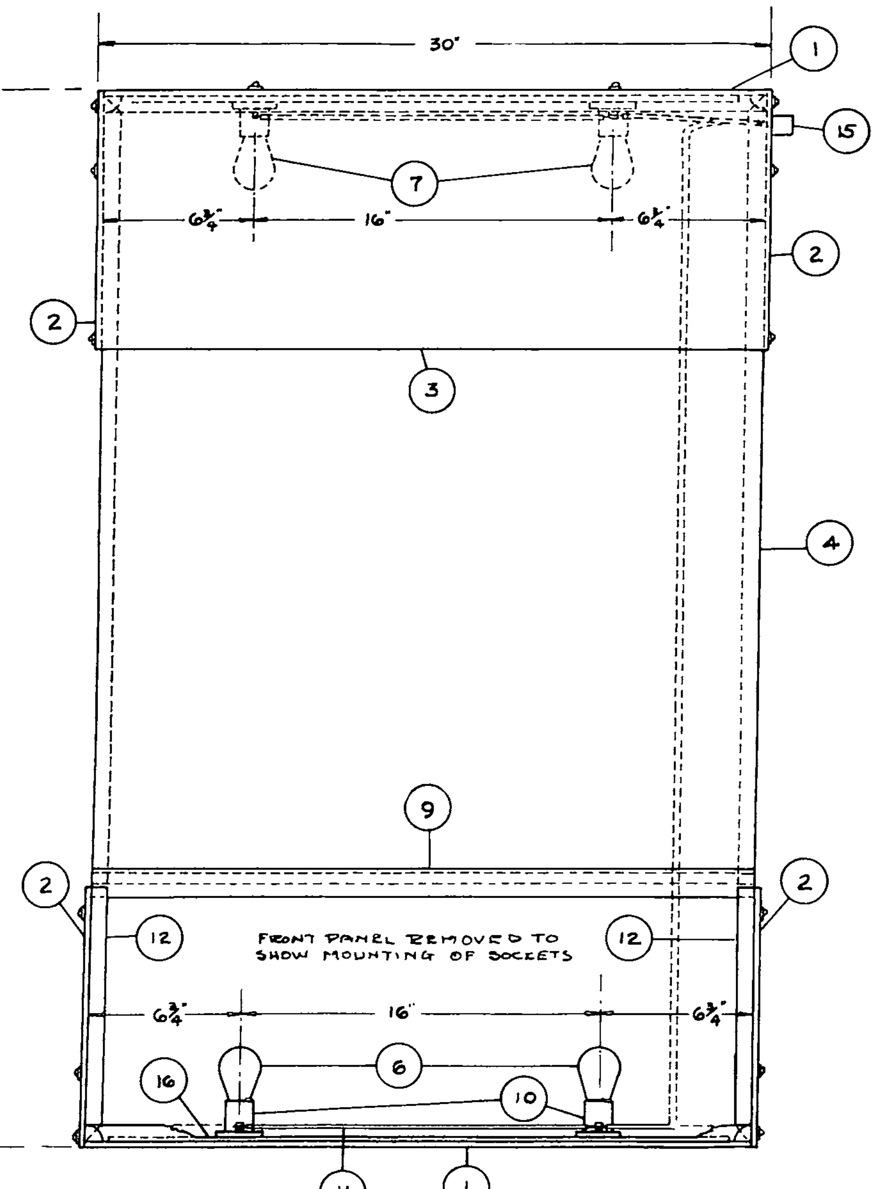
USE BRASS WOOD SCREWS TO
- Assemble Side Panels
- Assemble Top & Bottom Assembly To Back Panel

USE FLAT WHITE PAINT ON
- Inside of Top, Bottom and Front Panels

USE FLAT BLACK PAINT ON
- All Outside Surfaces
- Inside of Side Panels
- Inside of Back Panel

1—4' x 8' Plywood Panel is Sufficient





Committee Reports

REPORT OF THE PICTORIAL DIVISION COMMITTEE

THE Committee is pleased to report on the activities of the Pictorial Division for the past year. As you know, the International Salon of the P.S.A. is now a fact and is hanging in the Cleveland Museum of Art. We feel that it is the beginning of what will undoubtedly be the outstanding yearly salon of this country, if not the world, since it has the advantage of being supported by the P.S.A. and since it will hang at the time of the Annual Convention in a different city each year.

In connection with the salon the Committee wants to take this opportunity to thank the judges who so wholeheartedly gave of their time and money without expense to the Society. We also want to thank the members of the Society and others around Philadelphia, who under the capable leadership of John P. Mudd, our Chairman, did the drudgery of handling the prints, repacking, remailing, etc.

The Pictorial Division has coöperated with the convention committee and through the influence of both, some of the prominent speakers which you will have the pleasure of hearing during this convention, were secured.

In reference to the 100 Print Travelling Exhibit, this year it has been decided by the officers of the P.S.A. and the Pictorial Committee that it would be best to pick this show from the P.S.A. Invitation Salon exhibited at the New York World's Fair. This will save considerable work and the time of those who have done so much for this show in the past.

In reference to lighting standards for judging salons and exhibitions, a careful study was made by both the old and new committee regarding the amount and the color of the light to be used for such judging. By establishing a standard the exhibitor would know the exact conditions under which his prints would be judged and could make his prints accordingly.

While we are suggesting a special easel, details of which will be printed elsewhere, it is not absolutely necessary as long as the amount of light and color are the same as given. However, an easel was found to work out very satisfactorily at the judging of the P.S.A. Salon.

The amount of light to be placed on the print was determined after careful measurement in a number of exhibition rooms, museums, camera clubs, etc., and the most practical compromise at which the committee could arrive was 30 ft. candles of light. This amount was automatically given for the easel and it was the unanimous opinion of all twelve judges that it gave a very satisfactory illumination with a minimum of strain and without glare. The source of light is two forty-watt standard Mazda lamps at the top and two twenty-five-watt lamps at the bottom. This standard is recommended to the P.S.A. for final approval after which this standardized basis of lighting will be accepted for all judging of prints.

We are attaching a standardized set of conditions to be used as recommended practice in entry forms for the salons of this country. The Committee feels that these conditions are simple and should meet the needs of all pictorial salons. They are now awaiting the approval of the Society.

The Committee has also sounded out and given opportunity to the members of the Pictorial Division to express their opinions on various phases of work being done by the Division, and sincerely thanks those who took the trouble to amplify their wishes on their questionnaires with separate remarks, making it possible for the Committee to get a fairly comprehensive viewpoint of how the members feel.

From these written suggestions and personal conversations with the members whenever possible, the Committee now feels that it can recommend a simple and efficient setup which will enable the Pictorial Division to accomplish considerably more in the future.

It would be wise to revise the setup of the Pictorial Division so as to provide greater opportunities for personal contacts among the members. In the past we have operated almost entirely by mail and while mail communication must remain an important factor in the operation of the Division, due to the huge expanse of this country, additional personal contact among the members of the Division is of vital importance. Therefore, it is suggested that the members of the Pictorial Division be divided into geographical sections, and that any city or closely bound territory having twelve or more members should have regular meetings at least four times a year. At these meetings it will be possible for the members to discuss personally the various questions which will arise in connection with the work of the Pictorial Division.

These sections should appoint or elect an active member as chairman to convey the opinions of their section to the General Chairman and Corresponding Secretary of the Division. These chairmen should constitute the Pictorial Committee together with the General Chairman and the Corresponding Secretary. The General Chairman and Corresponding Secretary could be elected by this committee which will of course, be careful to select men willing to give of their time and enthusiasm to keep the Pictorial Division on the up grade.

Another important thing to be decided is just what is the scope of operation of the Pictorial Division, because unless this can be very definitely outlined, it would be difficult to avoid conflict and confusion with the operations of the P.S.A. itself.

It is suggested that in general this scope should be that all pictorial salons and anything sponsored or held by the P.S.A. along pictorial lines should be handled by the Pictorial Division alone. All matters relative to the operation of salons and the methods of judging, salon lighting, etc., should be handled as recommended practice by the Pictorial Division. The members of the Division should support their recommendations as it is only by so doing that many of the present day evils of salons can reach a minimum or be eliminated completely.

If the Pictorial Division is to operate successfully, it is necessary that it be alloted some of the funds of the P.S.A. to carry on its work through correspondence with its members, the handling of salons and many other matters. The Committee, therefore, suggests that fifty cents of the dues of each member affiliated with the Pictorial Division be allotted to the Division. This money should be handled entirely by the Pictorial Division, rendering due account to the P.S.A. as well as to the Division itself.

The above will give you an idea of the future operations of the Pictorial Division and such detailed activities as may come up from time to time can be added. The Committee will appreciate constructive criticism and suggestions regarding this program.

Conditions of Entry

Eligibility of Prints: Prints may be made by any recognized photographic process and no hand colored prints will be accepted. All prints should be entirely the work of the exhibitors.

Number of Prints: Not more than four prints may be submitted by any one contributor.

Mounts: All prints (foreign prints excepted) should be mounted on very light colored mounts and the mounts should not be larger than 20 x 30 inches but 16 x 20 inch mounts are preferred.

Note: Where it is impractical to handle mounts larger than 16 x 20, this should be definitely specified. However, unless absolutely necessary, prints should not be restricted to vertical mounts because for artistic reasons some pictures should be mounted horizontally.

Print Identification: The following data must appear on the back of the mounts:

A. Name and address of contributor
B. Number to agree with entry form
C. Title
D. Process

Responsibility: All possible care will be taken in handling the prints but no responsibility will be accepted by the salon for loss or damage of prints.

Entry Form: The entry form attached must be properly filled out and mailed with entry fee of $1.00 to the Salon Secretary. Checks and money orders should be made to same

Mailing of Prints: U. S. entries may be sent by post or Express using the attached shipping label. Foreign entries should be sent only by post marked "Photographs—No Commercial Value—To be returned to sender, etc."

Reproductions: Reproductions of prints for publicity purposes is assumed unless otherwise specified on the entry blank.

Note: The above covers the usual conditions of entry of most salons. Any exceptions from the above form should be clearly stated.

JOHN S. ROWAN

REPORT OF THE KODACHROME SLIDE INTERCHANGE COMMITTEE

NOW that summer is waning and we are getting ready for the season when we spend more time indoors, the Kodachrome Slide Interchange is ready to start operation. There have been a number of members who have indicated their desire to enroll in the Interchange. While the number is encouraging, it is not large enough to make the Interchange the source of entertainment and value that it can be.

Each member of the Slide Interchange will provide ten Kodachrome slides (2 x 2 inches) in suitable mounts, every ten weeks. These will be put together into a "Circuit" of 100 slides. Each "Circuit" will be routed around the ten members whose slides are included therein. This gives 90 new slides for each of the ten persons.

A member will be allowed to retain the box of slides for not more than one week, including a week end. Any member may participate in more than one circuit, the only requirements being that he provides ten slides for each circuit he wishes to enter.

Included with the slides will be a sheet giving the itinerary. Each member will forward the set with shipping charges prepaid and routes will be laid out so as to make these distances as short as possible.

While it will not be required, it will greatly increase the value of the Interchange if each member submitting slides provides notes as to exposure, subject matter, etc.

Every provision will be made to see that proper care is afforded a member's slides while in transport and in the hands of other members.

May I urge all P.S.A. members who have Kodachrome slides that are resting in slide boxes to sign up for the Slide Interchange. While it will be possible to join the Interchange at any time, let me have a postcard or letter signifying your enrollment at once.

M. C. NICHOLS, Chairman

REPORT OF THE SECRETARY

AS a result of the election held last month the following Directors were elected to serve until October 1942:

Leslie L. Bender
Don Bennett
I. R. Kuno

Tellers Robert Coope and Ernest E. Draper report that the General Assembly was reelected for a one year term as follows:

FOR THE INDIVIDUAL MEMBERSHIP

M. E. Baumberger — Don Loving
T. Buckwalter — Walter S. Meyers
Robert N. Bushman — R. W. St. Clair
Alfred A. DeLardi — George F. Slade
Paul L. Gittings — P. F. Squire
Dudley A. Hoover — Lola Stone
J. G. Lootens — Wm. H. Zerbe

FOR THE GENERAL ASSOCIATION OF CAMERA CLUBS

A. S. Anderson — Arthur Hammond
C. K. Archer — J. C. Moddejonge
F. M. Beckett — Dr. B. J. Ochsner
C. M. Brown — Dr. W. J. Ream
G. G. Granger — Dr. E. P. Wightman

FOR THE PICTORIAL DIVISION

C. S. Loeber — J. S. Rowan
J. P. Mudd — Dr. Max Thorek

FOR THE TECHNICAL DIVISION

J. W. McFarlane

FOR THE HISTORICAL DIVISION

Dr. A. J. Olmsted

FOR THE STEREOSCOPIC SECTION

Robert Dennis

FOR THE COLOR DIVISION

M. C. Nichols

FOR THE NATURE DIVISION

Tappan Gregory

FOR THE SUSTAINING MEMBERSHIP

Francis M. Moling

FOR THE ROCHESTER TECHNICAL SECTION

Dr. J. I. Crabtree — G. E. Matthews
Hugo Kurtzner — G. C. Whitaker
R. T. Soule

FOR THE ASSOCIATED CAMERA CLUBS OF CHICAGO AREA

H. J. Johnson — W. Mindling
R. H. Petty, Sr.

FOR THE METROPOLITAN CAMERA CLUB COUNCIL, N. Y. C.

C. T. Boyles — S. Grierson
E. E. Draper — A. S. Mawhinney
F. H. Rockett

FOR THE NIAGARA FRONTIER CAMERA CLUB COUNCIL

F. Stubinger

FOR THE COUNCIL OF CAMERA CLUBS, PHILADELPHIA

R. A. Barrows — Ruth Wotiz

FOR THE SOUTHERN CALIFORNIA COUNCIL OF CAMERA CLUBS

M. G. Lowe — R. L. Wakefield

FOR THE ST. LOUIS CAMERA CLUB COUNCIL

S. M. Chambers

FOR THE WASHINGTON CAMERA CLUB COUNCIL

Dr. D. R. Craig

FOR THE CAMERA CLUB COUNCIL OF GREATER CINCINNATI

S. Marean

Mr. Luini has so well covered the various problems of the past year in his President's Report that it is hardly necessary for me to add anything further.

The financial statement will be found on the next page. On December 5th, I reported to the Directors a bank balance of $153.31 and an indebtedess of $583.45; as of August 31st, our bank balance totaled $2,348.23 and net assets $2,023.23. During the first half of the fiscal year (July 1–December 31, 1939) the Society showed a loss of $525.47 against a profit of $1,212.84 for the period January 1 to June 30, 1940. However, these figures are misleading because there were practically no disbursements. Many of our most essential functions were paid for by other organizations in return for the personal services of your Secretary. If all actual expenses had been charged to the Society we would have shown a larger deficit for the second period. It goes without saying that a situation of this kind cannot exist indefinitely.

Only two gifts were received by the Society during the past year—one a trophy and a check for $50.00 from Dr. Max Thorek and the other $25.00 from the Secretary. Approximately $1,500 worth of photographic merchandise was donated by the Manufacturers and Distributors Bureau for prizes in the New York World's Fair P.S.A. Snapshot contest.

During a two weeks trip throughout the Middle West taken by your Secretary last May, a plan of individual affiliation was worked out with the Rochester Technical Section. It allows the members of this Section to join the National Organization under a special classification with limited privileges.

It is with regret that the Editors of THE JOURNAL announce the resignation of Glenn Matthews as Technical Editor. After six years of service Mr. Matthews finds it impossible to devote the necessary time to this job. We would like to express a word of appreciation for his untiring efforts and valuable advice; the success of the technical part of THE JOURNAL is due entirely to him.

The Society also owes an expression of thanks to J. Harris Gable who has done such an excellent job on his column and The Index, and to Miss Carol Kier, who has proof-read each issue without recognition or remuneration. To the authors and those who have aided the Editors at various times we add our sincere thanks.

I cannot close this report without mentioning three other gentlemen who have done a great deal for the Society during the past year. The success of the Membership drive is due entirely to the ceaseless efforts of Don Loving and Leslie Bender. The Club Print Interchange and all contests at the World's Fair were handled with efficiency by Robert Coope. The Society will never be able to repay these three members for the many sacrifices of time and energy they have made.

F. QUELLMALZ, JR.

Financial Report Year Ending June 30, 1940

Balance in hands of Treasurer July 1, 1939......			$609.89
Receipts:			
Dues			
Individual	$2,871.00		
Contributing	167.50		
Clubs	896.25		
Councils	145.00		
Sustaining	390.00		
		$4,469.75	
Interchange Reimbursements		183.39	
Loan Service Reimbursements		277.21	
Convention		493.25	
Miscellaneous			
Initiation	$630.00		
Entry Fees—100 Print Salon '38–39	158.00		
Loan Service — To cancel advance	234.05		
Sale of Booklets.....	40.27		
Reprints	406.79		
Insurance Collected ..	61.00		
Loan	100.00		
Continental Monthly Print Contest			
Entry Fees	10.00		
Advance	7.00		
Gift—Dr. Thorek ...	50.00		
Sale of Journal......	26.00		
Interest on Savings Account	14.65		
Withdrawal from Savings Account	100.00		
Shipping Cases	10.70		
Miscellaneous	15.88		
		1,864.34	
Total Receipts			7,287.94
			$7,897.83
Disbursements:			
(1) Office of the President			
Stationery	$39.44		
Postage	92.32		
Stenography	186.82		
Clerical	43.50		
Miscellaneous	18.16		
			$380.24
(2) Office of the Secretary			
Printing	$82.41		
Stationery	77.89		
Address Plates	19.97		
Equipment	13.40		
Postage	94.87		
Supplies	16.45		
Stenography	102.80		
Miscellaneous	18.45		
			426.24
(3) Office of the Director of Publicity			
The Journal			
Printing	$1,250.63		
Half-tones and cuts	582.47		
Postage	132.04		
Envelopes	39.33		
Reprints	203.50		
Miscellaneous ...	4.76		
		$2,212.73	
The Bulletin			
Postage	$93.55		
Envelopes	13.67		
Stenography	13.25		
		120.47	
			$2,333.20
(4) Office of Exhibitions Committee			
100 Print Salon			
1939	$139.30		
1940	52.92		
		$192.22	
Club Print Interchange			
Stenography	19.63		
Postage	51.00		
Express	66.65		
Printing	44.20		
Miscellaneous ('38–39)	98.18		
		279.66	
Continental Monthly Print Contest			
Postage & Express	$13.15		
Shipping Cases..	14.89		
Printing	14.75		
Miscellaneous ...	180.11		
		222.90	
Loan Exhibit Service			
Postage	$32.82		
Express	25.47		
Telegraph	11.84		
Shipping Cases..	27.00		
Printing	44.21		
Advance ('40–41)	49.60		
Miscellaneous ...	265.79		
		456.73	
Foreign Travel Salons			
Insurance	$7.50		
Advance	25.36		
Duties	30.00		
Miscellaneous ...	38.44		
		101.30	
Special Exhibits ..		17.01	
Miscellaneous			
Printing	$18.30		
Insurance	159.70		
Postage & Express	4.29		
		182.29	
			$1,452.11
(5) Office of Membership Committee			
Postage	$15.74		
Stenography ...	3.63		
Supplies	24.48		
Printing	269.97		
			313.82
(6) Office of Conventions			585.71
(7) The Pictorial Division			19.89

(Concluded on page 46)

ELIMINATION OF HYPO

(Concluded from page 13)

9. Smith, A.: On the Removal of the Last Traces of Hyposulfites from Positive Paper Prints. B. J. Phot., **13**, 226, May, 1866.
10. Spiller, J.: Photography in Its Chemical Aspects. Phot. J., **11**, 16, 58, June, 1866.
11. Footnote, Das Lichtbild, **7**, 42, 1931.
12. Sheppard, S. E., and Ballard, A.: The Covering Power of Photographic Silver Deposits—Part I. J. Frank. Inst., **206**, 659, 1928.
13. Hickman, K. C. D., and Spencer, D. A.: The Washing of Photographic Products. Phot. J., **62**, 225, 1922.
14. Sheppard, S. E., and Ballard, A.: The Covering Power of Photographic Silver Deposits—Part I. J. Frank. Inst., **206**, 135, 137, 139, 1928.
15. Eder, J. M.: Structure and Composition of Silver Bromide Gelatin Plates, Films, and Developing Papers. Camera (Luzern), **4**, 29–31, 1925–26.
16. " Evaluation of Motion Picture Film for Permanent Records." Miscellaneous Publication No. M-158, 5, 1937, of the U. S. Department of Commerce, National Bureau of Standards.

CHRONOLOGICAL HISTORY OF HYPO ELIMINATORS

1855—Alum—" On Positive Printing," by J. Newton (J. Phot. Soc., *31*, 176, June, 1855). ". . . immerse in hyposulfite for about 2 or 3 minutes, then in alum water for half an hour and change the water entirely two or three times."

1855—Caustic Potash—" Communication on Positive Photographs," by Mr. Malone (J. Phot. Soc., *31*, 177, June, 1855). " I suggest that you should treat the positive photograph, fixed in the ordinary way, with a strong solution of caustic potash heated to about 180° Fahrenheit; . . . carefully washing out the potash."

1856—Dilute Alkali or Alkaline Carbonate—" Photographic Chemistry," by F. Hardwick, Churchill, London (Third Edition, page 170, 1856). ". . . and the removal of the size which can be effected by means of a dilute alkali or an aklaline carbonate, . . . has the additional advantage of carrying out the last traces of hypo-sulfite of soda . . ."

1864—Hypochlorous Acid—" Minutes of Meeting of South London Photographic Society," by F. W. Hart (B. J. Phot., *11*, 82, March, 1864). Suggested the use of chlorine and barium chloride in aqueous solution to convert hypo to barium sulfate and sodium chloride.

1866—Hydrogen Peroxide—" On the Removal of the Last Traces of Hyposulfites from Positive Paper Prints," by A. Smith (B. J. Phot., *13*, 226, May, 1866). Recommended the use of hydrogen peroxide, diluted with one thousand times its volume of water, for one or two minutes. He advised the neutralization of the acid in the peroxide with soda The treatment required a rinse in water as the final operation.

1866—Hydrogen Peroxide and Ammonia—" Photography in Its Chemical Aspects," by J. Spiller (Phot. J., *11*, 58, June, 1866). Used hydrogen peroxide with ammonia but claimed that the two were " mutually decomposed." Then suggested treating first in hydrogen peroxide followed by ammonia. *Note:* A discussion of this paper, reported in B. J. Phot., *13*, 283–4, 1866, recommended treating the prints first in ammonia and then in hydrogen peroxide.

1866—Sodium Hypochlorite—" On the Elimination of the Double Hyposulfites of Soda and Silver from Photographic Prints," by F. W. Hart (B. J. Phot., *13*, 290, June, 1866). Recommended sodium hypochlorite followed by very dilute ammonia to dissolve traces of silver chloride.

1866—Chloric and Perchloric Acids—Editorial—" Permanent Prints: A New Plan," by Messrs. Tichborne and Robinson (B. J. Phot., *13*, 580, Dec., 1866). Twenty-four grains of barium chlorate are dissolved in one ounce of water and 20 minims of 12% perchloric acid added. For use add 2 ounces of this solution to one pint of hot water. Treat prints for about an hour and wash in water.

1872—Iodine—" The Chemistry of Photography," by W. Harrison (The Scoville and Adams Co., New York, N. Y., p. 412, 1892). Vogel is credited with the first use of iodine. After careful washing the prints were placed in water to which enough iodine solution was added to give it a sherry color; then rinsed in a very week solution of sulfite and sodium carbonate to remove the blue color and finally washed in water.

1881—Alum—" Notizen zum Bromsilber—Gelatine Verfahren," by J. M. Eder (Phot. Korr., *18*, 203, 1881). Used a saturated solution of alum diluted one to ten with water.

1881—Zinc Hypochlorite—Messrs. L. Belitzski and G. Scolik (Eder's Handbuch, Part III, Knapp, Halle [4th edition], 317, 1890). Used in dilute water solution. Known as Flandreaus' eliminator in America.

1883—Bromine Water, Etc.—" Die Beseitigung des unter schwesligsauren Natrons," by F. Stolze (Phot. Wochenblatt, p. 348, 1883). Javelle water, hydrogen peroxide, iodine water, bromine water, lead nitrate, and barium nitrate are discussed. Alum with citric acid in water was suggested. Successive five-minute treatments were used and the wash water tested after each wash. None of these was considered entirely satisfactory.

1888—Hypo Eliminator—" Early History of Hypo Eliminators," by F. W. Hart (B. J. Phot., *35*, 151, 1888). The claim to the original use of the term " hypo eliminator " is made.

1889—Sodium Chloride—Editorial (American Photography, *19*, 38, 1889). Reference to the use of sodium chloride as an eliminator by Dr. Bannon but no directions are given.

1894—Potassium Persulfate. Mention of its use by Schering is made by L. P. Clerc in his book " Photography—Theory and Practice," Pitman, London, page 269, 1930.

1897—Iodated Salt—" Sel Iode Eliminateur Rapide Des Hyposulfites," by M. P. Mercier (Bull. de la Soc. Franc. de Phot., *30*, 296, 1897). A suggested formula was iodine 3 parts, salt 30 parts, and sodium carbonate 30 parts dissolved in 1,000 parts of water. " Decolorize with ammonia just before use. The print may be left in this solution for a long time because the colorless solution does not attack the silver image. Iodine or iodides may be used with alkali or alkali salts and bromine or bromides may be used but the latter are much slower acting."

1901—Potassium Percarbonate—Use by G. Meyer is mentioned by L. P. Clerc in his book " Photography—Theory and Practice," Pitman, London, page 269, 1930. No directions are given.

1902—Ammonium Persulfate—" Use of Various Oxidizers for the Destruction of Hypo," by A. & L. Lumière and A. Seyewetz (Bull. de la Soc. Franc. de Phot., *10*, 270, 1902). Hydrogen peroxide, potassium percarbonate and commercial ammonium persulfate were the best hypo oxidizers but ammonium persulfate was the most practical provided the free acid was first neutralized with either carbonate, bicarbonate, alkaline phophates, alkaline citrates, alkaline tungstate or borax. Low concentrations were satisfactory.

1903—Alkaline Perborates—G. F. Jaubert. Mentioned by L. P. Clerc in his book " Photography—Theory and Practice," Pitman, London, page 269, 1930. No directions given.

1903—Sodium Chloride—O. Baysellance (Phot. Rev., *12*, 32, July 26, 1903). " Treat one-half to one hour in 3% sodium chloride and then give three or four rinses in water."

1904—Potassium Permanganate—" Permanganate as an Eliminator of Hypo," by I. Pearse (J. Phot. Soc. India 1904 Cf. Photography, *20*, 197, 1905). Use water slightly colored with permanganate and use successive solutions until no change in color occurs. Less than ten minutes of this treatment was equal to two hours' washing.

1912—Bisulfite—Formaldehyde—"A Hypo Remover," by E. D. Davison (Camera Craft, *19*, 30, 1912). Recommended water 40 parts, sodium bisulfite 3 parts, and formallehyde 8 parts. Treat prints (after washing) for 10 to 15 minutes in a solution diluted 1:3 with water.

1922—Chloramine T (Sodium *p*-toluene Sulfochloramide)—"A New Quick Clean Eliminator of Hypo," by E. F. Shelberg (Amer. Phot., *16*, 267, April, 1922). Dissolve one tablet in 40 oz. water and treat for two or three minutes, washing before drying.

1923—Dilute Sodium Carbonate—Unpublished data on the use of alkalies in hypo elimination by F. J. Norton and J. I. Crabtree (Kodak Research Laboratories), July–August, 1923. Dilute solutions of sodium carbonate were recommended for use immediately after fixing.

1923—Alkali Carbonate or Phosphate—"Adsorption of Sodium Thiosulfate by Photographic Paper," by A. Charriou (Comp. Rend., *177*, 482–4, 1923). Claimed that hypo was displaced more readily by washing in a solution of alkali carbonate or phosphate than by water.

1925—Ferrous Sulfate—" Hypo Eliminators and Intensifiers." British Patent 225,664, Oct. 9, 1923 (B. J. Phot., *72*, 24, 1925). Three parts ferrous sulfate and one part sodium chloride were thoroughly mixed. Prints were treated in a solution containing 8 grains of this mixture in 1½ pints of water and washed before drying.

1925—Sodium Hydroxide—" Hypo Eliminator," by A. E. Amor (B. J. Phot., *72*, 18–19, 1925). Claimed that 0.2% sodium hydroxide and a persulfate formula of the following composition were most effective eliminators but neither was an improvement over careful washing: Persulfate 6 grams, sodium carbonate 12 grams, water 1,000 cubic centimeters.

1931—Sodium Hypochlorite Plus Sodium Chloride—R. Namias (Il prog. fot., *38*, 125, 1931). This combination was an improvement over hypochlorite alone. Negatives were washed five minutes, treated in 0.3% sodium hypochlorite plus 1% sodium chloride solution and washed for one or two minutes.

1931—Hydrogen Peroxide Plus Ammonia—Note in Das Lichtbild, *7*, 42, 1931. Ammonia was added dropwise until the solution just smelled of ammonia.

1932—Dilute Caustic Soda—" The Use of Alkalies as Hypo Eliminators," by E. E. Jelley (Phot. J., *72*, 480–5, 1932). Kodak Research Laboratories Communication No. 503H.

1937—Sodium Carbonate 1%—" On the Possibility of Improving the Permanence of Photographic Prints," by E. Weyde (Veröff. wiss. Zentral-Lab. phot. Abt. Agfa V, 181–186, 1937). Also, B. J. Phot. *82*, 376, June 14, 1935, and Photo Woche *25*, 474, 1935. For best hypo elimination the use of a nonhardening fixing bath followed by bathing in 1% sodium carbonate before washing was recommended.

PROFESSIONAL PHOTOGRAPHER

(Concluded from page 14)

capable of making a profit, you have some novel, if not sad, experiences in store. Then is when you get whittled down to your size, and you'll be surprised what that size is. Selling photography is not the easy thing it has appeared.

In fact, it is rather possible that the day of the individual studio is almost over. It may be that there will be a few rare exceptions, but on the whole there is reason to conclude that pictures will be merchandised by some sort of wholesale method which will permit the very profitable mass produced and low priced article so popular in America today.

I know what you are, no doubt, saying. You are contending that so and so told you that they would not buy mass produced photographs. So what? That person is the exception and not the rule. If you disbelieve me, please go into business and at the end of one year we'll talk this matter over, and you can tell me what the problems of the professional photographer are. What I have enumerated here will be but a grain of silver on an " 8 by 10 " in comparison to what you will be able to describe.

If you are contemplating becoming a professional photographer, try selling pencils on the street first. Then, if you really don't like it, try photography and believe and believe that there is room at the top. Beliefs have been known to come true; so the books say.

PRESIDENT'S REPORT

(Concluded from page 34)

of course, been excluded from consideration. The fact that the gentlemen who were selected have accepted these awards is sufficient indication of the prestige of the Society.

I have already given the figures on the increase in the number of Affiliated Associations and, correspondingly, in affiliated clubs. It must be pointed out that the present financial and other arrangements between these Associations and the Society are not to be considered as final. The field is new and a certain amount of experimentation must be done to arrive at arrangements which are mutually beneficial and just, both to the Associations and the Society.

In conclusion, it is my opinion that the officers, Board of Directors and members of the Society have every reason to be proud of the great strides made during the past year. We must, however, throw ourselves with renewed vigor and enthusiasm into the task of solving the pressing problems which still face us and particularly the problem of obtaining new members. The Society has attained a position of leadership in photography which involves heavy responsibilities. The ideas and efforts of every member and of every forward-looking photographer are needed if we are to meet these responsibilities and justify our leadership.

ABSTRACTS OF PAPERS

(Concluded from page 5)

Rembrandt series, and a few theatrical effects. Her talk will cover high key, low key and full range pictures, showing how to obtain them, including exposure and development. This demonstration will cover all the simple principles of lighting a portrait and obtaining a good likeness of the subject, as well as a few things to avoid, and special lighting arrangements for the various types of faces. She will show charts to explain the lamp positions, some portraits taken by her students and a few of her own.

DR. FAIRFIELD OSBORN, President, New York Zoological Society—"*What Photography Means to the Natural Sciences*"

October 26—8:30 P.M.

Presentation of a number of examples where photography has proved of great value in the development of various sciences. A summary of various types of photography which are particularly useful. Proposal for a new "profession" which calls for the interpretation of the natural sciences to the general public through the medium of the lens. Opportunity of the motion picture film to be the interpreter between the scientific research worker and the public at large.

I. C. YOUNG, A.R.P.S., The Haloid Company—"*Some Contributions of Photography to Modern Life and Culture*"

October 27—11:30 A.M.

An appreciation of aspects of photography which contribute to extensions of human knowledge, health, safety, and well being.

ROY E. STRYKER, Chief, Historical Section, Division of Information, United States Department of Agriculture—"*Photography—A Tool for the Social Scientist*"

October 27—12 M.

The camera has taken a new and important place in our contemporary life as a recording and reporting mechanism. Through technical advances in the field of photography, a more realistic and versatile type of photography has followed.

Imaginative photographers now find themselves in possession of instruments with which to do things little dreamed of before. Editors and writers are receiving from these photographers a product which is making for a new journalism.

The physical scientist has long accepted photography as an important tool to be used in his work. The social scientist too has much to gain from an intelligent acceptance of this new mechanism—as research tool and reporting device. He must recognize its weakness as well as its strength.

TAPPAN GREGORY, Temporary Chairman, Nature Division of the Photographic Society of America—"*Wild Animal Photography*"

October 27—2 P.M.

Every youngster has an instinct to hunt. The actual killing is the least important part of the hunt. Substitution of camera for firearms brings obvious advantages. This form of hunting knows no closed season, no bag limit, no forbidden ground, and all animals, large and small, are legitimate subjects. They divide themselves into several categories,—those in captivity, those in refuges, reserves or sanctuaries, changed in habit because of the protection afforded or the influence exerted by man and the encroachments of civilization, and those in their natural state. It is the picturing of the animals in this last classification that is interesting to me. These animals may be pursued with the camera by stalking, from blinds, from a boat at night under the jacklight, or with a set camera. There will be shown a brief selection of pictures from the accumulation of thirty-five years. They are all what they purport to be and they cover a wide range of subjects, from tiny mice and shrews in a back yard to foxes, coyotes, wolves, cats, cougars, bears, deer and moose.

Special Exhibits During the Convention

The Photographic Society of America International Salon
The Rochester Technical Section 90 Print Exhibition of Photography in Science and Industry
Farm Security Administration Exhibit
Wild Life Photographs by Tappan Gregory
Northern Ohio Camera Council Salon
Metropolitan Camera Club Council of New York 100-Print Salon

FINANCIAL REPORT

(Concluded from page 41)

(8) General and Miscellaneous			
Stationery	$118.63		
Supplies	79.79		
Return of McMurtry Gift . .	100.00		
Repayment of Loan	100.00		
Salaries	67.50		
Miscellaneous . . .	39.11		
		505.03	
			6,016.24
Balance in hands of Treasurer June 30, 1940			$1,881.59

PROFIT AND LOSS STATEMENT

Receipts July 1, 1939–June 30, 1940		$7,287.94	
Disbursements July 1–June 30. . . .		6,016.24	
			$1,271.70
Less—Accounts Payable		$729.33	
Accounts Receivable		145.00	
			584.33
Profit 1939 40			$687.37
Cash on hand July 1, 1939.			609.89
Savings Account June 30, 1940. . . .	$100.01		
Accrued Interest	1.00		
			101.01
Net Assets June 30, 1940. .			$1,398.27

Audited by Albert W. Doig

F. Quellmalz, Jr.
Secretary—Asst. Treasurer

THE PHOTOGRAPHIC SOCIETY OF AMERICA, Inc.

FROM THE ARTICLES OF INCORPORATION OF THE P.S.A.

The objects of the Society shall be: Promotion of the art and science of photography in all its various branches, through individual memberships, associated camera clubs and other photographic organizations, research and dissemination of photograph knowledge, and promotion of photographic salons and exhibitions.

OFFICIAL DIRECTORY

OFFICERS

Frank Liuni .... *President*
107-69 109th Street, Richmond Hill, N. Y.
L. H. Longwell .... *1st Vice-President*
Dr. A. E. Banks .... *2nd Vice-President*
Dr. L. L. Handly .... *3rd Vice-President*
F. Quellmalz, Jr. .... *Secretary-Asst. Treasurer*
Ten Park Avenue, New York, N. Y.
C. B. Phelps, Jr. .... *Treasurer*
A. W. Doig .... *Assistant-Treasurer*

BOARD OF DIRECTORS

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Dr. A. E. Banks, San Diego, Calif.
Leslie L. Bender, Lansdowne, Pa.
Don Bennett, Washington, D. C.
B. H. Chatto, Pittsburgh, Pa.
L. L. Handly, Houston, Texas.
Forman Hanna, Globe, Arizona.
I. R. Kuno, Omaha, Nebraska.
L. H. Longwell, Elmhurst, Ill.
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