
Academy Technicians Branch

TECHNICAL
BULLETIN

1935 Volume

Hollywood, California

May 31, 1935

THE
THREE COLOR
PROCESS



*The Academy builds harmonious relations within
the Motion Picture Production Industry and ad-
vances the Arts and Sciences of Motion Pictures.*

HOLLYWOOD

The Technicolor Process of Three Color Cinematography

J. A. BALL*

HISTORICAL DEVELOPMENT

IN the earliest days of the Technicolor development, we recognized that the ultimate goal of workers in the field of color cinematography must be a process which would add a full scale of color reproduction to the existing black-and-white product without subtracting from any of its desirable qualities, without imposing any complications on theatre projection conditions, and with a minimum of added burden in the cost of photography and in the cost of prints. These considerations seemed to clearly indicate a three-color subtractive printing process capable of ultimate low cost of manufacture.

In those days, most other efforts to develop a subtractive printing process made use of double-coated positive stock, invented about 1912 by Hernandez-Mejia. We found a number of objections to the use of this stock; particularly, to the spatial separation of the two components, to the susceptibility to scratching during processing and projection, but most of all, to the impediment imposed upon an ultimate three-color result.

Surveying the field, we chose to work on the multi-layer, or monopack process, and the imbibition process. In a monopack process the several components are in successive layers all coated on the same side of the film strip. In the imbibition process, the several components consist of images formed in water soluble dyes printed onto, or rather into, a gelatine coated film strip much as colored ink images are printed onto paper in the process of photo-lithography. A multi-layer, or monopack, process can theoretically be used as a taking process and as a printing process; whereas imbibition, being a photo-mechanical process, is limited to use as a printing process and requires to be supplemented by a taking method, preferably one providing distinct separation negatives. As printing processes, both monopack and imbibition yield a final product containing all components on one side of the film strip and with no limitation as to their number. Some fundamental and far-reaching work on the monopack process by the late Dr. Troland, who at the time of his death was Research Director of Technicolor, resulted in the issuance in 1932 of Reissue Patent No. 18,680, containing two hundred and thirty-nine claims, broadly covering this field both for taking and printing. The imbibition process seemed to present a less formidable array of processing problems than did the monopack process, so we pushed its development with even greater effort.

*Vice-President and Technical Director, Technicolor Motion Picture Corporation.

We found it necessary to split the problem into two stages. As the first step in an imbibition process it is necessary to prepare a film bearing images consisting of a raised relief of hardened gelatine. This relief image, or matrix, serves the same purpose as the etched copper or zinc plate of photo-lithography. First, we had to find out how to make a gelatine relief suitable for use as a printing plate. We decided to content ourselves temporarily with two components and to stop short of actual imbibition by making use of an intermediate process wherein two gelatine reliefs, produced on thin celluloid, were glued together back to back and dyed up in complementary colors. Prints of the Technicolor sequence in "The Ten Commandments," and of Douglas Fairbanks' all color picture, "The Black Pirate," were made in this manner.

Then, after having learned how to make gelatine relief matrices of good quality, we tackled the problem of making adequate transfers from those matrices. We had to learn how to prepare the blank film so as to permit imbibition without diffusion. We had to devise a transfer machine capable of handling film in long lengths and in quantity, and on which blank and matrix could be brought into registered contact and held there for several minutes while the dyes transferred.

Simultaneously with work on these various subtractive printing processes, we devised a camera which gave two-color separation negative images free not only from fringing and parallax but also free from the harmful effects of celluloid shrinkage. In this camera the two images were in symmetrical pairs, one being the mirror image of the other. These were arranged on a single strip of negative stock with both members of the symmetrical pair positioned accurately with respect to symmetrically adjacent pairs of perforations. The perfect geometric symmetry of this arrangement is shrinkage-proof during the entire life of the negative. The very compact prism system of this camera permitted the use of relatively short focal length lenses. The aberrations of the glass path were taken into account in the computations for these lenses.

Two color imbibition prints were brought out commercially in 1928, just about the time that sound swept the industry. We were then immediately faced with the necessity of combining color with sound. The only procedure obvious at that time was to make the sound track identical with one or both of the picture components; but this would give a sound track in dye, which would have varying absorption throughout the range of wave lengths to which photo-electric cells are sensitive. The response from such a track would then, of course, be different for one type of cell than for another type of cell, and especially so in the case of a variable density track. We avoided this problem by starting, not with a blank film, but with a strip of positive stock on which the sound track could be printed and developed in silver while leaving the picture area blank. Imbibition transfer of the picture components into this blank area could then take place. This method is capable of giving a sound track absolutely identical with that used in the black-and-white art. Better yet, because of the complete separation of the sound track technique from the picture

technique, the necessity of any compromise between sound and picture quality is eliminated and ideal sound track processing conditions are possible. Many millions of feet of two-color imbibition prints with a silver sound track were produced by Technicolor in 1929 and subsequent years.

THE THREE-COLOR PROCESS

We were now ready to move on to a three-color process. Since we had planned on it from the beginning, we encountered no fundamental impediment in our printing process. Mechanically, we had merely to combine the imbibition paths in groups of three instead of in pairs.

The proper choice of dyes presented more of a problem. In a two-color process many colors are compromised, so to speak, and there is considerable choice as to the manner and extent of compromise. In a three-color process, the accuracy of reproduction is greatly increased and the freedom of choice is greatly restricted.

An adequate three-color camera was an exceedingly difficult problem. Those three-component taking methods which use only a single aperture (monopack, screen plates, and lenticulated films), have advantage of economy of light and of mechanism, but they all have other disadvantages, particularly when it comes to separating or differentiating between the various components; and some of them present difficult raw stock manufacturing problems.

On the other hand, cameras which split the light to three separate apertures, while photographically and optically simple, have the disadvantage of loss of light in the splitting process, long or complicated optical paths, increased size, and mechanical complexity. We chose as a favorable middle-ground solution an intermediate line of attack wherein *three* records are obtained at two *apertures*.

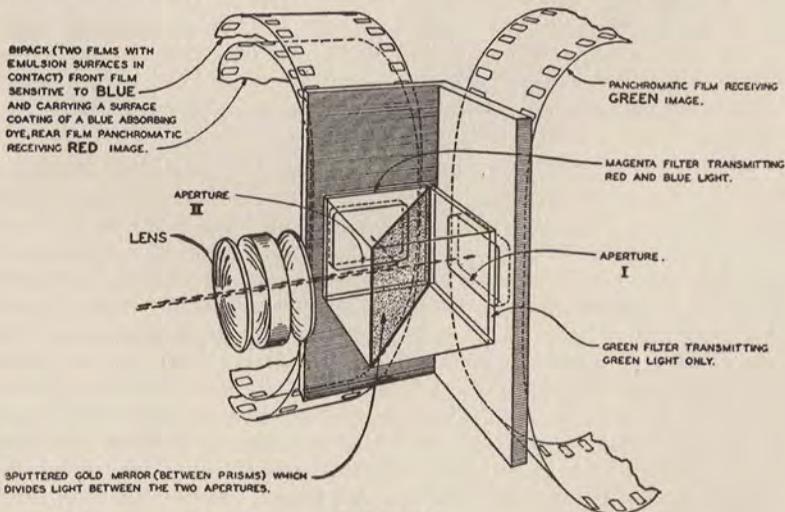


FIGURE 1

Fig. 1 shows schematically the arrangement of optical parts and films in this camera. In making use of a bipack at one aperture, we

have incorporated means for the practical elimination of halation and also for the elimination of any dependence on the surface coating of one of the films for the exact determination of our red light filter. Thus, two of the most serious faults of ordinary bipacks have been removed.

To insure that there shall be no differential shrinkage amongst the three strips of negative, we specify that the celluloid base shall be of the low shrinkage type as made by the Eastman Kodak Company. This low-shrink celluloid base is of such quality that after processing the negative, including the manufacture of a volume of release prints, the shrinkage is approximately $\frac{1}{8}$ of 1%, with differences in shrinkage amongst the members of a group of about $\frac{1}{8}$ of the total shrinkage. This amounts to a small fraction of $\frac{1}{1000}$ " across the longest dimension of the picture and is therefore entirely negligible.

A group of five lenses ranging in focal length from 35 mm. to 140 mm. have been designed for this camera to our specifications by Messrs. Taylor, Taylor and Hobson. The chromatic correction of these lenses has been designed to give, in cooperation with our film arrangement, three images of unusually high correction, thus compensating for the loss of definition in the red record of the bipack. The most notable feature of these lenses, however, is the inclusion in the 35 mm. design of what might be called the inverse telephoto principle whereby the back focal length is considerably longer than the equivalent focal length.

OPERATION OF THE THREE COLOR CAMERA

However, it is not the purpose of this paper to go into further detail as to the design and construction of the camera, but to move on to a discussion of the methods of operation of the camera. First, however, for the benefit of those to whom the reproduction of color is somewhat of a mystery, a brief outline of the complete process as we now work it is perhaps desirable.

The Technicolor three-color camera photographs the three primary aspects of a scene (red, green, and blue) on to three separate film strips, simultaneously, at normal speed, without fringe or parallax, in balance, and in proper register with each other. These separate strips are developed to negatives of equal contrast and must always be considered and handled as a group.

From these color separation negatives, we print by projection through the celluloid of a specially prepared stock which is then developed and processed in such a manner as to produce positive relief images in hardened gelatine. These three hardened gelatine reliefs are then used as printing matrices which absorb dye and then transfer this dye by imbibition printing onto another film strip which, when it has received all three transfers, becomes the final completed print ready for projection. To carry on the process of imbibition, it is merely necessary to press the matrix film into close contact with a properly prepared blank film and hold it there for several minutes. Matrices, of course, can be used over and over again.

The colors of dyes used in the transfer process must be the subtractive primaries, namely, minus-red (or cyan), minus-green (or

magenta), and minus blue (or yellow). The relation of the taking colors to the printing colors is made clear in the accompanying diagram (Fig. 2).

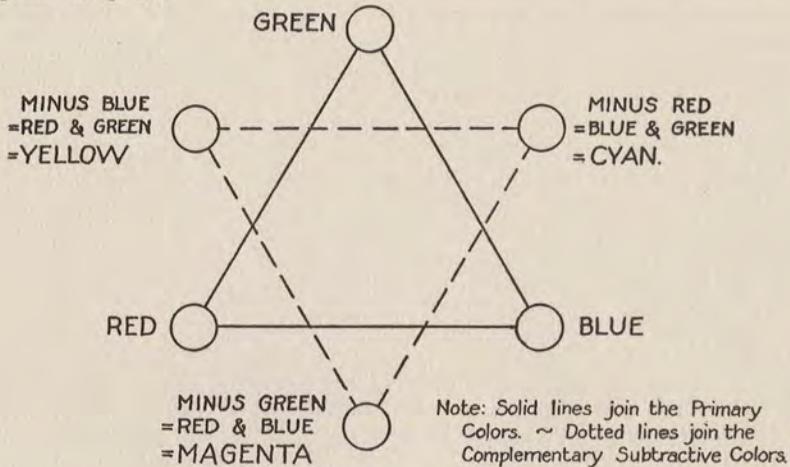


FIGURE 2

To show the manner in which the final print is built up, we have prepared a short demonstration reel of a single scene. First you will see the sound track and the yellow dye component, next the cyan component, finally the magenta component and then the complete image.

PHOTOGRAPHIC PRINCIPLES

The process just described is designed to reproduce whatever was placed in front of the camera, not only as to color but also as to light and shade. But even the best of reproduction procedures, even that of oil painting on canvas, is rather severely limited when it comes to reproducing light and shade. The contrast from whitest white to blackest black in a painting is perhaps 1 to 32. Upon projection from transparencies, as in motion picture work, the range may be slightly greater, about 1 to 64, but in no case is the great range of sensitivity of the eye adequately reproduced. The art of painting and the art of photography then, have this in common: that they seek to suggest a great range of visual contrasts by a skillful use of the more limited contrasts available in the method of reproduction.

In color photography, all very full exposures tend to bleach out to white and all low exposures tend to drop into black. A high-light on a face in black-and-white photography can, in the final print, be merely the bare celluloid and the result will be still entirely satisfactory; but if, in a color print, such a condition exists, the delicate flesh tint will, in that area, be bleached out to white and the face will look blotchy. All areas of the face should, therefore, be reproduced in such a manner as to yield a good flesh tint. Very light makeups, and oily makeups having considerable shine are apt to be troublesome. In any case, it is necessary to control the light and lighting contrasts accurately and to avoid "hot spots."

The art of the color cinematographer is intermediate between that of the painter and that of the stage artist. The painter has to work with pigments having a limited range of contrast but has great freedom of choice as to composition. The stage artist works with light and so does not encounter the pigment limitation, but he must select his costumes, backgrounds, etc., to be harmonious in a great variety of arrangements, most of which are more or less out of his control. In color cinematography the difficulties of both are combined; there is the pigment limitation combined with the comparative lack of control of composition. To illustrate this difference let us take, for example, a scene wherein a figure clad in white is to be illuminated by red light, as from a fire which is not visible to the audience. The stage artist, in arranging such an effect, must have a suitable background for the figure when it is viewed from a great many different angles. In arranging his lights, however, he can call for more and more intense beams of red light until he has achieved the desired effect. If a painter is endeavoring to get the same effect in a painting, he can select a favorable pictorial composition, but to depict the red illumination he can only use the brightest red pigment in his palette. If he is dissatisfied with his first effort, he cannot heap on more and more of his red pigment. Obviously nothing is to be gained in that manner. He can only improve his result by suppression of, or contrast with, the background. Now in color cinematography, the brightest red that is available is the full value of red pigmentation in the film, and this is obtained by full value of the magenta and yellow dyes without any cyan dye. These conditions result from full exposure of the red negative with no exposure in the green and blue negatives. If the color cinematographer is not satisfied with this full pigmentation and endeavors to get a more intense red by piling on more red light in front of the camera, he merely over-exposes the red negative and begins to get some exposure in the green and blue negatives. The corresponding areas in the print tend to bleach out to white. The significance of the pigment limitation can be summed up in a very few words; if the desired effect can be shown in a painting, it can be photographed, and if it cannot be painted, it probably cannot be photographed. While no such brief statement is ever strictly true, this one contains such a large percentage of truth that it is worthy of being set up as a guiding principle.

LIGHTING FOR COLOR PHOTOGRAPHY

In color photography, it is necessary to operate at rather high levels of illumination. If one is not careful, this may lead to a condition like this: given only relatively weak light sources, one finds it necessary to use a great many of these sources, in order to attain an adequate level. The widespread distribution of these units then tends to kill all shadows and eliminate modeling on faces. If, then, the attempt is made to provide modeling by superimposing a localized shaft of light as from a spot light, the face is burned up, blotchy and generally unrecognizable. The way out of this dilemma is to recognize that modeling should properly be produced by shadows, and to use fewer and brighter sources or to mass the sources of illumina-

tion so that shadows have a chance to exist. In other words, it is just as important for the cameraman to determine directions from which light shall *not* come as it is to determine directions from which light *shall* come.

While color contrasts will occasionally produce a pleasing result when flatly lighted, that is not the way to get sharp photography, nor in general, the most pleasing photography. The Technicolor process is capable of reproducing a full scale of contrasts and those effects of light and shade (*chiaroscuro*) and those directional effects so striking in black-and-white are even more effective in color. These considerations apply not only to the lighting of figures and faces but also to the design and lighting of sets. In the design and painting of sets, the art director should have in mind the cameraman's problem of achieving the necessary light levels with a minimum number of sources of illumination. Under these conditions, it is always much easier to keep parts of a set in low key by keeping light away from them, than it is to paint them dark and then be forced to illuminate them strongly.

ARC LIGHTING

This need for fewer and brighter sources is one of the reasons why we choose carbon arcs in preference to incandescent tungsten lamps. Another reason is the fact that only in the white-flame carbon arc and in sunlight do we find the correct balance of blue and red components for the photographic emulsions with which we have to work. If tungsten lamps were to be used, it would be necessary to throw away the excess red light by the use of blue glass bulbs or overall filters. An added reason for the use of arcs is that at the high levels of illumination which we require, the heat rays emitted by incandescent lamps are a serious problem. Arcs radiate more light and very much less heat.

If incandescent units were properly filtered to correct the color of the light and to absorb heat rays they would undoubtedly be useful on special occasions.

Special arc units have been developed by the National Carbon Company and Molé-Richardson for use in connection with the Technicolor three-component process. They have been designed to solve some of the earlier difficulties with arcs, especially noise and flicker. The older type of arcs also gave off some smoke which appeared as carbon dust in the air, but it is possible to incorporate absorptive means in the vents to absorb this smoke. The only drawback to the use of arcs is the necessity for "time out" for retrimming, but this can usually be made to coincide with other "time out" activities, particularly if the head electrician works closely with the director.

There is no danger of Kleig eyes when using arcs, providing only that a sheet of ordinary glass is between each arc and the eyes of the people. This is a simple enough requirement and entirely eliminates any danger.

The required level of illumination is not very different from that which was in use by many black-and-white cameramen before the

introduction of supersensitive film. We have devised methods of measurement of illumination levels for the guidance of the cameraman.

EXTERIOR COLOR PHOTOGRAPHY

Exterior photography divides itself into four classifications:

- (A) Sunlit shots wherein the scenery is of maximum importance. These occur abundantly in travelogues and scenics and quite frequently in dramatic photography, especially in the establishing long shots.
- (B) Sunlit shots wherein faces are of greatest importance.
- (C) Imitation sunlit exteriors built on a dark stage and artificially illuminated.
- (D) Night exteriors.

In group A there are pronounced differences between color photography and black-and-white photography because color photography can reproduce those pleasing color contrasts of sky, water, blue haze, foliage, beach, etc., which are almost entirely lost in black-and-white. Furthermore, there is always a strong directional effect to the sunlight with very pronounced shadows. A front cross-light is best in color, whereas a side or back cross would generally be preferred in black-and-white.

In class B it must be realized that few faces will stand the harsh lighting of the direct sun as in a front cross-lit setting. So gauzes, diffusers, reflectors, and sometimes "booster" light, must be called into use. Conditions are then most favorable if the sunlight comes from behind the figure. This is true in color or in black-and-white. The skillful cameraman takes advantage of the changing directions of sunlight throughout the day to schedule his shots and angles for best results. Cooperation between director and cameraman in such cases is even more important than in the case of exteriors.

It is, of course, perfectly obvious that if artificial light is to be mixed with daylight as in the case of "booster" light, that the color of the "booster" light must approximate sunlight. Here again the use of carbon arcs in preference to incandescent lights is clearly indicated. One might wonder if the change in sunlight quality from morning to late afternoon might not show on the screen in abrupt changes in color of successive scenes. We have found it generally possible to correct for any such differences in the printing. Such correction, however, is not possible where one encounters simultaneously very yellow light from the sun with blue shadows illuminated from a clear sky. Such an effect will, of course, carry through to the screen and a very beautiful effect it is, too.

The set-ups of group C are very troublesome if the illusion of reality is of importance. This illusion almost always is important in a motion picture so that the artificialities of the usual stage lighting are scarcely acceptable at all. Shadows can perhaps still be painted on buildings, walls and backgrounds but of course not on people. Nor can the shade of a tree be so imitated. What is really needed is

a light source of greater power than any now available. Pending its development, the well-known California sun promises to return to its former importance. In other words, sizeable sunlit exteriors to be photographed in color had best be real. The difficulties of imitating grass, shrubs, etc., also argue in the same direction.

In the case of night exteriors (class D), color has one great advantage over black-and-white in that it is possible to contrast moonlight and lamplight for example by the use of blue and amber filters.

RECORDING FOR COLOR PRODUCTION

Technicolor adds practically no complications to sound recording other than a somewhat noisy camera and the necessity of eliminating "whistle" from the arcs. If the camera is adequately blimped, the problem of camera noise is solved forthwith. The whistle caused by high frequency ripples in the electric current coming from the commutator of direct current generators can be practically removed by the combination of an alternating current filter at the generator and additional choke coils at the individual arc units.

PHOTOGRAPHIC EFFECTS IN COLOR

When we come to the trick department, however, color has its special problems. Fades, lap-dissolves, wipe-offs, etc., can all be made by duping all three negatives and taking pains to preserve the register, exposure, and contrast balance. Those methods of composite photography which depend on color differences cannot be used in Technicolor. The projection background process is, of course, ideal for trick shots in color. However, there is the problem of adequate illumination of the projection screen. So far, projected backgrounds have been used in Technicolor only in relatively small areas such as through the rear window of a taxi or limousine. Eventually, we hope to be able to work out means for handling projection backgrounds in very much larger sizes but at present we are rather restricted.

CONCLUSION

There is a general appreciation of the fact that "color is coming." When sound swept the industry several years ago, it meant the introduction of a new and different technique, and of men of new and different training. The sound engineer was the "big shot." The cameraman was locked in a padded cell with his camera, and the art director was told how he could and could not construct his sets to meet the new acoustic considerations. Conditions will be much more enjoyable for everyone concerned when color sweeps the industry. The sound men will not be affected in any way at all but the cameraman and the art director will be given new tools to work with whereby the value and importance of what they can contribute to a picture will be greatly increased. For these reasons it is to be expected that the technicians generally will be enthusiastic and cooperative with the rising tide of color.

It is the policy of the Technicolor Company to organize and maintain a nucleus camera department and color art department for the purpose of accumulating experience and disseminating information and advice as to the skillful and effective use of Technicolor. Beyond this nucleus the policy is to invite cooperation from the studio organizations and especially from those cameramen and art directors who desire to continue to lead in their respective fields. These men will generally be surprised first at the extent to which their conscious sense of color has become atrophied through lack of use while working in black-and-white, and second, at the speed with which they can regain it, and third, at the utter inadequacy of black-and-white photography in comparison with good color photography.

When our color was of inferior quality, we used to hear the expression "color interferes with the drama." Since the introduction of the three-component process, the expression has been rapidly fading out of use. Good color assists good drama. Dr. Herbert T. Kalmus, President of Technicolor, has supported a liberal policy of research and development work since the organization of the company. This policy is continuing and the work involves nearly all departments. We propose to continue to improve our product until the last doubter is swept off his feet.

MR. MACGOWAN:

Another paper which was prepared for tonight is "Color Consciousness," by Natalie M. Kalmus, Color Director of Technicolor. I must read this in her absence.

Mrs. Kalmus has a kind of double job at Technicolor. In the case of certain color pictures, Mrs. Kalmus has supplied the art direction and supervised the actual use of color in costumes and settings. In the case of "Becky Sharp," Robert Edmond Jones, the scene designer, did this work, but Mrs. Kalmus was responsible for the study of what colors and what shades of colors are modified in reproduction through the color camera, and for the solution of the many technical problems involved in getting on the screen what we want you to see.

Some Problems in the Direction of Color Pictures

ROUBEN MAMOULIAN*

LADIES and gentlemen: As I sit here, I am amazed at the quality and nature of this meeting. I have attended meetings concerning the arts of the theatre, music and literature, but never have I witnessed the overwhelmingly scientific atmosphere that prevails here. I must say that this unusual atmosphere of the present meeting is characteristic of the whole industry and art of motion pictures. No art has ever depended so much on science as the art of motion pictures. In that sense it is truly the most modern of arts. It begins where science ends and it has a hard time, and not always a successful time, in artistically keeping up with the progress of the scientific and technical achievements that are taking place constantly in motion pictures.

Seven years ago motion pictures were revolutionized by the advent of sound. Theretofore silent, the screen acquired the gift of speech. Today, as another result of scientific achievement, color comes to the screen and to my mind, it is just as much of a miracle as sound was. I would like to pay my most respectful tribute to those people whose names one doesn't hear who work in the silence and solitude of their laboratories. I refer to the scientists that compose the body of Technicolor, whose destinies are guided by Dr. Kalmus.

"WILL COLOR LAST?"

Now the main question today is: "Will color last or will it not?"

I have no doubt that color on the screen is here to stay. I have also no doubt that there will be as much skepticism for the first few months in regard to color as there was in regard to sound.

They say that what we don't have, we don't miss. No one ever missed electricity until it came to replace oil and gas. No one missed dialogue on the screen while the screen was silent. However, let a dumb man, after thirty years of life acquire the gift of speech, would he want to give it up and go back to his silence? Speech came to the screen and stayed—victorious. Now, let a man with ailing eyesight wearing black glasses through which the world looks grey, suddenly recover his sight, throw away his glasses and see the luxury of the color of the sky, the earth and the flowers, would he ever want to go back to his black glasses? We never missed color on the screen because the very art of the cinema was born black and white. It was a convention which had to be accepted, but once real color comes on the screen, we shall feel its absence as forcefully as we feel the absence of sound when looking at a silent film made some years ago.

*Director of "Becky Sharp," the first three color feature motion picture.

I do not mean to say that necessarily all the films will have to be in color, but certainly the great majority of them will be. As in the art of painting, while we admire and love black and white drawings and etchings, could we ever do without paintings? So far the screen has been using a pencil; now it is given a palette with paints.

I don't want to be misunderstood. I don't want to imply that the black and white film is not beautiful nor that the color film completely displaces the black and white. As a matter of fact, the black and white has a beauty of its own that could never fade away. The very unreality of those pale shadows moving on the screen and that remote quality of a dream, constitute the attraction and the spell of the black and white film that could not be destroyed. There will always be room for certain subjects to be treated in terms of these fascinating grey shadows. But color comes to the screen now as a new Spring to the earth. It comes as an inspiring and exciting gift, which opens new horizons of creation for the artist and enjoyment for the onlooker.

I am stating this now not merely as a theoretical point, but as a result of an actual experience I went through recently. This experience was directing "Becky Sharp," the first full-length feature in color. That was a new and wondrous adventure. It had all the thrill and excitement of pioneering in a new field and discovering a theretofore unexplored fairyland.

COLOR A VITAL FACTOR OF EVERYDAY LIFE

Color is one of the most powerful and fascinating attributes of nature. Just imagine what the world would look like if you took color out of it. What would life be if we were forced to spend it among sky, trees, flowers and all things black, grey and white? Having known the living joys of color, we would probably die of melancholia.

Love of color and susceptibility to color is one of the strongest instincts in human beings. If you want to discover the most organic, basic elements of the sophisticated human being of today, go to children and go to savages. You will find that next to food, they love things of vivid color and sparkle. That instinct is alive and strong in every one of us.

In relation to motion pictures, our need for color has so far been ungratified. We accepted the situation just as we had accepted the fact of moving on solid ground until we learned to fly. But once color comes to the screen, we will be unhappy without it. It brings a new terrific power to the screen. Our strongest impressions come through vision. So far visually, we are dealing with light and shade and compositions on the screen. Now we have an additional element of color. This, not merely to superficially adorn the images in motion, but to increase the dramatic and emotional effectiveness of the story which is being unfolded to the spectator.

Color, like all power, can be harmful and destructive when used badly, life-giving and creative when used well. Animals and human beings have always been and are unconsciously subject to a hypnotic influence of color. How many times have you walked into a strange

house and felt depressed because of the color of the wallpaper? How many times have you found consolation in the rich riot of shades of a gorgeous sunset?

Apart from pure pictorial beauty and the entertainment value of color, there is also a definite emotional content and meaning in most colors and shades. We have lost sight of that because like all important and inevitable phenomena, it has become subconscious with us. It is not an accident that the traffic lights of a city street today are green for safety and red for danger. Colors convey to us subtly different moods, feelings and impulses. It is not an accident that we use the expressions: "to see red," "to feel blue," "to be green with envy" and "to wear a black frown." Is it for nothing that we believe that white is expressive of purity, black of sorrow, red of passion, green of hope, yellow of madness, and so on. The artist should take advantage of the mental and emotional implications of color and use them on the screen to increase the power and effectiveness of a scene, situation or character. I have tried to do as much of this in "Becky Sharp" as the story allowed. To quote an example of this, I would refer to the sequence of the panic which occurs at the Duchess of Richmond's ball when the first shots of Napoleon's cannons are heard. You will see how inconspicuously, but with telling effect, this sequence builds to a climax through a series of intercut shots which progress from the coolness and sobriety of colors like grey, blue, green and pale yellow, to the exciting danger and threat of deep orange and flaming red. The effect is achieved by the selection of dresses and uniforms worn by the characters and the color of backgrounds and lights. There is a little of homecoming feeling in this for me as the use of color and colored lights was one of my main joys and excitement in the theatre. Surely, the effectiveness of productions like "Porgy," "Marco Millions" and "Congai" which I have done in the theatre would have been sadly decreased if I were forced not to use color in sets, costumes and lights on the stage.

SOME STORIES "NATURAL" FOR COLOR TREATMENT

Of course, in each art, different subjects are expressed best through different forms. Undoubtedly, there are some stories which beg for color on the screen more than others do. Off-hand, a story of historical period of the past, when life and clothing were much more colorful, or stories with the backgrounds of countries like Spain and Italy, even of today, would ask for color more than some stories of our modern age and civilization. The black and white films will still have their place on the screen, but most assuredly as time goes by, there will be less of them and more of the color pictures. For even though our life today is grey (and because of that), we have a great love and longing for color. Is it not to be more attractive that women dress their bodies in beautifully shaded gowns and touch their faces with the subtle magic of a discriminate makeup? Is it not the same impulse that drives the grey and tired families of working-men out to Sunday picnics somewhere where there is a touch of blue sky, a green blade of grass, a tree or a flower?

Everything that is beautiful to the eye is a great gift to humanity. Color on the screen is such a gift. The only danger of it that I can see during the first stages of the color picture, would be the danger of excess. Talking pictures did not avoid it during the first months of their existence. There was too much talk and too much noise on the screen. The cinema must not fall into another trap and must not go about color as a newly-rich. Color should not mean gaudiness. Restraint and selectiveness is the essence of art.

Remarks on the Production of a Three Color Motion Picture

KENNETH MACGOWAN*

I'm going to start by repeating something I said at the Society of Motion Picture Engineers' luncheon yesterday. I'm not repeating it for my own benefit but because I want to say it to the members of the Technicians Branch as well as of the Society. I feel a great deal of envy for you people who work on the technical end. As a producer I'm always running up against questions like these: Is it safe to do this story? Can I do this story as well and as uncompromisingly as it ought to be done?

So often in the producing end we find that we are restricted by the public, or at least by what we think the distributors think the public thinks, and we end by doing a lot of things not nearly as well as they ought to be done.

I noticed, however, in the first three months I was out here that the technicians always seem to do their job just as well as it could be done. They aren't up against the problem of what some picture owner thinks the public wants. Nobody says that what Ray June is doing is over the public's head. Nobody says that the sound in "One Night of Love" is too good for the motion picture audience, nor does anyone say that "Roberta" is too well cut for the masses to understand.

I envy the fact that you are always allowed to take as your motto, "perfection pays."

Probably you are laughing up your sleeves because you find your equipment a little antiquated or you are up against financial difficulties, but you never have that horrible bug-bear—"what the public wants"—"the public won't stand for perfection." I know now that two major companies are debating whether or not they can make the greatest play in the English language, and that's a pretty disheartening idea.

I want to tell you roughly the history of RKO's contact with Technicolor. About two years ago Merian Cooper persuaded Jock Whitney to make motion pictures in the new Technicolor process.

*Associate Producer, RKO-Radio Studios. Producer of "Becky Sharp."

At that time he was the head of the studio and I was lucky enough to be assigned the first picture in color. Then Mr. Cooper was taken ill. While he was away we determined not to make a long picture but a short. That was "La Cucaracha." This fall when Mr. Cooper recovered and was ready to go to work again, he had to make two pictures in black and white, and again I had the good luck to be on the job and to do "Becky Sharp." I'm boring you with this history only to give a bow to Merian Cooper as the father of three color production on the screen.

Another thing I want to say about technicians is that it seems to me they are wonderful people to deal with. I've found that true in the studio and particularly true at Technicolor. As soon as I went to work on "La Cucaracha" and "Becky Sharp" I came more and more into contact with these people and I found them quite as intelligent, quite as farseeing as I had found them twenty years ago in Philadelphia when, as a motion picture editor, I first came in contact with Dr. Kalmus and his co-workers. I could name half a dozen men at Technicolor who have done wonderful work, not only in devising this new process but in cooperating with and understanding the rather screwy people connected with production.

Before you see the reels of film which we have here to show you, I would like to point out one thing which seems quite significant to me. There is some resistance to color due to the fact that we discovered black-and-white photography first.

Suppose there had never been black-and-white photography or black-and-white half-tone reproduction. Suppose we had been used to color photographs and colored pictures for the past fifty or seventy-five years. Then if someone invented the black-and-white photography and black-and-white half-tones the result would, I am sure, be frightfully disappointing and definitely puzzling. We would have to translate all the tones almost as we translate a foreign language mentally when we hear someone speaking it. We would have to figure out mentally what actual color was represented by the grey of a face, the black of a tree, etc. I found somewhat the same effect after I saw a two-color picture, "The Wax Museum." When a normal black-and-white picture came on the screen it gave me a curious psychological shock and the thought, "What is this—a painting in mud?" Experiences like this are going to beat down our instinctive resistance to color.

One thing that is going to push color very far ahead is television. I was in the theatre a good many years as a producer, and I saw the road destroyed by the movies. The silent screen was destroyed by the talking picture. Then the talking picture had to meet the competition of the radio. Now they tell us television is coming, and motion picture producers are beginning to worry about it. People can turn a little button and sit at home and be entertained, but they are going to get that entertainment in black-and-white for a good many years. Color television will come undoubtedly, but it will come late, and in the meantime the screen will be able to use color against the competition of television. There will be an added sense of vividness in the theatre that will not be apparent on the home screen.