Discussion of Dr. Ives' Paper

Mr. Cook: I would like to ask Dr. Ives if standard film without any change in the emulsion was used, or was a particular form of emulsion necessary?

Mr. Ives: The negatives are made on ordinary Eastman film.

Mr. Cook: I mean the positive.

Mr. Ives: Made on ordinary Eastman positive film.

Mr. Cook: Was there any re-sensitation for the second image?

Mr. Ives: It is re-sensitized—as a matter of fact, I will try to explain a little in detail. I made one print and developed it into color. That print is chemically converted into a blueprint. That leaves in the film a considerable amount of unchanged bromide of silver. I say "unchanged,' 'but, as a matter of fact, it is affected to a certain degree by the development. That is not sufficient to make a second print in that is satisfactory. You could make a print, but it is no good for the purpose. The blueprint which is produced by converting the first image is a mixture of Turnbull's blue and ferro-cyanide of silver. The ferro-cyanide of silver I reconvert into bromide of silver. The consequence is when I make the second print, I have the same amount of bromide of silver as I had in the first instance.

Mr. Cook: Then you dry and reprint with the red?

Mr. Ives: Yes.

Mr. Cook: How do you get your red then?

Mr. Ives: Well, I make another image and develop it as a black positive, and then convert it by my dye-toning process. It is bleached and put in a dye bath and takes up the color. There are a number of original features in the process which I have not gone into, which are the subjects of patent. One, for instance, is in the red print. Now, the theory as it has been worked out by others involves making from the red selection negative a blue or a green print; from the green selection negative a red print. Now, the red print which I make is red in the deep shadows; it is orange in the lighter shades, and yellow in the extremely pale shades. Not to go into detail, which is given in certain publications of mine, it works out in this way; that by this means you can get in the landscape blue sky, green foliage, red, orange and yellow fruits and flowers. You cannot do it with a combination of two simple colored images, like the red and green which was previously used.

Mr. Ives: If you have paid particular attention to the attempts made in the processes already exploited, you will see that until recently the colors were crude. There were fruits, like oranges, which should be yellow, and they were simply a degraded red. They were an offense to the eye. I claim by this method it is possible to reproduce the colors of objects which heretofore it was impossible to reproduce in the two-color process. I get about as many colors as in the three-color process, but at a little sacrifice. Cobalt blue photographs like a black; a bright magenta pink would reproduce

as orange, and a very pale lemon yellow would become almost white. Nevertheless, it gives such a close approximation that it is pleasing to the eye and very satisfactory, and very much cheaper than any three-color process possibly could be for this purpose .

Mr. Cook: How is the expense of that compared with double-coating?

Mr. Ives: First of all you save the difference in cost of ordinary film and double-coated film. Just what that difference in cost is I don't remember. I never do remember figures, and don't know much about money. I never have any, anyway. That is the first advantage, and then the handling of single-coated film can be done with ordinary appliances, and the double-coated film because of the two soft gelatine coatings require special appliances for handling.

Mr. Gregory: Mr. Ives, you referred to the publications which you had published, in which you have said something about your work, motion pictures in colors. Are any of these publications available, purchasable?

Mr. Ives: They are rather scattered, and some of the information which might be of interest to you has really only appeared in patent specifications. One of the patents which I regard as of great importance was only issued a few days ago. If you will give me your address, I might find something in connection with the subject that will be of interest to you.

Mr. Richardson: Has the color process anything to do with the lack of sharpness in the pictures you have shown?

Mr. Ives: No; that was due just to plain amateur work done by a man who was interested in color, and had no experience. I had no proper laboratory facilities and never had been in a laboratory where that work was done, so allowance, in justice to me, must be made for the amateur character of the work in some respects.

Mr. Mott: I would like to ask Mr. Ives if this process is the same process used in his still photographs, called the Hess-Ives?

Mr. Ives: No; it is not.

Mr. Mott: Quite different?

Mr. Ives: Entirely different.

Mr. McNabb: I would like to ask Mr. Ives if arrangements have been made for compensating shrinkage; that is, to superimpose the second exposure over the first?

Mr. Ives: I will say in relation to that that when I started these experiments, in printing the second image in on the first, I printed three images at a time. I soon found that wouldn't do, because one film or one negative would shrink more than another and the three images would not all register at the same time. I do it now in a step printer and print a single image at a time. There is sometimes actual difference in the size of the image, but the difference is so small that if the image registers in the center, nobody notices it in the picture.

Mr. McNabb: Wouldn't that account for the lack of sharpness?

Mr. Ives: As a matter of fact, the thing is very completely under control with proper appliances and care.

Mr. Ives: I have a little frame of Eastman positive film here which has been subjected to this treatment with different dye baths. The colors I have used here are perhaps none of them what anybody would use for a particular purpose, but they illustrate the different values, the slight differences of color that can readily be obtained.

I have a black positive here, then a kind of brown above it, and a yellower brown below. In greens I have a yellowish green, and a blue green and dull blues, a sage green, and three or four strips of film here which have been completed, subjected to the bleach, and dyed to colors so transparent that it is nothing but pure color.

I have no doubt myself that because of its extreme cheapness and simplicity this will supersede every other method of putting color into cine pictures. I will be glad to answer any questions.

Mr. Victor: Mr. Chairman and gentlemen, I don't think I can comply with your desire for a discussion. I can only compliment Mr. Ives on his wonderful paper. It is not only, so far as I can tell, a wonderful scientific paper, filled with scientific data, but he has completely advocated what I consider the most common sense method of toning or rather, dyeing films.

The method now employed of toning, as far as I can tell, has one great drawback, and that is a lack of permanency. I have noticed reels—we saw one last night, one of the Williamson submarine pictures—that had evidently been toned with sepia, and we could see what had happened to this print. After having been in use two or three years, or rather having been lying idle that long, it was filled with spots and discolorations, and I don't think, so far as I know, that this system of dye-toning has that fault, and I think Mr. Ives stated that it did not, and his experience has covered so many years in this sort of work that he certainly could inform us as to the outcome of the work.

With respect to the color photography process shown yesterday, it is the simplest of them all. It starts with the ordinary positive film, and is, so far as I know, cheaper all the way through, but I could not give any figures on it.

This method of toning film is cheaper than the others simply because the solution is cheaper. It has other advantages of course, but as I say, the preparing bath for this toning process costs less than a cent a gallon, and it only exhausts with use. It does not precipitate like chemical toning solutions. You can mix up a solution of this and use it six months from now and get the same result you could today. It is very cheap and quite permanent.

That is an interesting fact; this matter of permanency of the prints.

The original toning process was Dr. Traube's iodide process. Now, iodide mordants basic dyes, but does not prevent them from fading in the light. You take an iodide image and put it out in the sun; take malachite green, and it will fade very rapidly indeed. Take this mordant of mine silver ferricyanide, put the same dye on it, and put it out for six months, and it doesn't change color, so that there is some chemical difference in the combination.

Mr. Victor: Mr. Ives has this system been employed in the studios very much?

Mr. Ives: I don't know that it has at all. The fact is, my first publication of this suggestion of only immersing in a dye-bath to prepare without actually bleaching the image—the first suggestion I made of it in a publication only appeared two weeks ago.

Mr. Victor: Is this process similar to that which is employed now in using the subtractive form of color photography?

Mr. Ives: Yes.

Mr. Victor: It is similar, but it is applied to the dye-toning of film?

Mr. Ives: In using it in color photography, you bleach the image completely, using a stronger solution—bleach it down to a pale yellow image, and then dye it. For toning you use a solution so weak, or for such a short time, that it doesn't apparently have any effect on the black silver image at all. Nevertheless, it has prepared it to take the dye. Therefore, we simply add our color to the original black image.

Mr. Victor: Do you allow the film to remain in the dye solution to saturation, or do you have to watch for the depth of tone?

Mr. Ives: You can do as you choose about that. As a matter of fact, there is a limit to the amount of dye it will take up with a given treatment of the bleach, but you don't reach that limit with some dyes in less than a half hour, but you can watch it. You can take it out and wash it at any time.

Mr. Victor: Dr. Ives, as I see this thing, it is a simpler and cheaper way of toning films than the method we have employed in the laboratories?

Mr. Ives: That is what it is.

Mr. Victor: Will you enumerate the advantages of this over the other once more?

Mr. Ives: Well, the preparing solution which makes the film take the dye color costs less than a cent a gallon; the chemical toning solution costs a good deal more. This solution does not precipitate or go bad, with time, or use, except as you actually exhaust it, and you can use the same solution for years if you were to add simply a little concentrated solution to keep up the strength of it, which is not true of any of the dye-toning baths. They all gradually precipitate and go bad.

Again, in chemical toning, you are limited to a certain range of colors which can be obtained with the chemical process, such as peacock blue, with the iron process; reddish brown with uranium; a pink brown with copper. With this, you can have absolutely any tone you choose. You can take, for instance, three or four dyes, which will combine in different proportions to make any color under the sun. You simply choose the color you want and mix your dyes accordingly, and you have got it. It is not a question of what color copper makes, or what color iron makes, or uranium; it is a case of what colors you want, and mixing your dyes, and there you are.