JOINT DISCUSSION OF

A REVIEW OF PROJECTOR AND SCREEN CHARACTERISTICS, AND THEIR EFFECTS UPON SCREEN BRIGHTNESS*

by

A. A. COOK

and

AN ANALYSIS OF THEATER AND SCREEN ILLUMINATION DATA**

by

S. K. WOLF

MR. LESHING: I am somewhat disappointed in what I have heard this morning at this meeting. The language I speak is somewhat different from yours. For me, logarithms do not exist. What I am concerned with primarily are the things that we all do; but some of us dilute our doings with so many words that we forget the substance. I heard here today things that I really could not understand, and other things that I understand only too well.

Take, for instance, the statement that there is nothing wrong with projection today. That is a point upon which I shall have to disagree. I brought a print of *Metropolitan* from Hollywood which I thought was a good print from an exceptionally well photographed negative. When projected upon the screen at the Radio City Music Hall, the picture which in Hollywood was excellent, was so bad as to be almost unrecognizable. It was necessary to make a new print having considerably greater contrast, to suit the projection conditions of the Music Hall.

I admit I was bewildered. Imagine what happens in the local theaters throughout this great country when we send out our prints. We talk about standardizing printing; we tell ourselves that the processing today is quite good; we say that projection is all right; and then project the film upon the screen without knowing what the result will be.

If the Society is going to spend most of its time on theoretical matters and very little on practical suggestions to the industry, the usefulness of the motion picture engineers will be negligible. I say that because I have the interest of the Society at heart. I know, in the past, the standards of the Society were adopted and did a great deal to improve motion pictures. Out on the Coast I believe we are making a little better progress because we talk practical things—how to show the product we sell to the public. What I should like to see the Society do is to adopt a standard of illumination. Do not say that 8 to 12 candle-power is all right. It is not right, when a picture that looks good upon one screen will look bad upon another. And besides, there are many other factors involved besides the illumination on the screen.

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* See p. 522.

** See p. 532.

We make better pictures in spite of ourselves. The stock is much better; there is no question about that. The cameras are much better. With the advent of sound we began to learn the *ABC*'s of processing film. But the main thing, the projection of the film, the presentation of the finished product to the public, is in a very poor state. If I can not be sure that a print when projected in New York in a theater as modern as the Music Hall will be equally as good as it was when projected at Hollywood, then projection practices are not what they should be.

MR. JONES: Sometimes it is good for one to have some criticism, and very severe criticism. However, I should like to point out that we are at least making an attempt; we are trying to make a start. Perhaps some of us have not had the long years of experience that Mr. Leshing has had, and we have yet to learn to walk before we can run. But I can assure Mr. Leshing that the Society is doing and wants to do all that it can to contribute to practical conclusions. We may start in a different manner, but I believe we shall arrive, and will try to do so as promptly as possible.

MR. SCHLANGER: The disappointing quality of the picture projected at the Music Hall is directly due to the great viewing and projecting distances. Such a condition emphasizes the need of establishing correct standards of viewing distance, screen brightness, visual acuity, *etc.* Satisfactory results were obtained when the print was projected in the Hollywood review room because the film was magnified during projection only to a comparatively small extent. The projection and viewing distances were short. On the other hand, in the great Music Hall auditorium, the picture was magnified to such an extent as to weaken and dissipate the blacks, thereby losing contrast and picture quality. An exact understanding of proper viewing distance and illumination levels would obviate the uncertainty mentioned by Mr. Leshing.

Which course are we to follow? Are we to take into consideration the existing theaters having viewing distances totally incorrect and build equipment to compensate for the faults of yesterday, or establish proper standards for new or altered theaters? There is now considerable activity in theater building, but the new and altered theaters will be erected properly only if the Society will help to establish the proper theater shape.

It has been stated that the patron does not complain of poor viewing conditions. The truth is that he does not usually *voice* his complaints. There is no doubt that theaters having better viewing conditions will be patronized the more, other things being equal. A patron will sit in poor seats only when he has no other choice, and will make every possible effort to obtain a better seat in spite of the annoyance of having to do so.

There has been a tendency to increase the screen illumination, due to the excessiveness of the viewing distances, and manufacture all kinds of equipment to do so. As a result, the forward half of the orchestra floor is rendered useless, because the brightness of the screen is too great for close viewing, and suits only the last few rows of seats. We shall have to choose between manufacturing equipment for obsolete theaters or gradually working toward the kind of equipment that will fit the correct and proper standard conditions for new and altered theaters.

MR. TASKER: In the course of being practical we must recognize, as Mr. Schlanger has indicated, that there are so many factors that it is difficult to put

one's finger immediately upon the thing or things that should be modified in order to accomplish what we want to accomplish. It is important that we recheck each of the factors. Perhaps the projector is not able to do a good job of projecting. That should be checked. We refer also to practical experience—the fact that you found on the West Coast adequate projection for the picture you brought with you. As a point of information, where did you find that the projection was adequate? Was it in all, or several, of the theaters in Los Angeles; or was it only in the review room of the studio, which may possibly have had characteristics slightly differing from those of the Music Hall?

MR. LESHING: Our review rooms are fairly uniform, and average about 11 foot-candles in intensity. At the Music Hall it is 7.

MR. TASKER: Was that the principal fault?

MR. LESHING: It was, I believe, the principal cause of the flatness of the picture upon the screen, and that is why the higher contrast picture with the same density solved the problem.

Far be it from me, gentleman, to say that I do not appreciate or value all the scientific research you do. You could not do the marvelous things you have done without all this preliminary scientific work. What I want to emphasize is, do not go up too high. Keep your feet upon the ground, even if you keep your heads in the clouds. I believe that you are attacking the problem from the farthest point. Most likely you are right—but not from the producer's standpoint, because the producer is not really interested in the theory; he is interested in the product he is selling.

All over the country we hear complaints about release prints. A lot of money is being spent on the West Coast to make pictures technically better. We build expensive sets and pay large salaries to men who can offer us just a little more than the other fellow; yet the final result goes out as a poor print with poor projection. It is not only a question of prints. Prints could be standardized throughout the country within a short time, with very little effort. But that can not be done until projection is standardized, and I believe that some form of standard can be set up right now that will not entail changing all the equipment.

MR. TASKER: That, I believe, was the thought behind the original suggestion that screen illumination be tentatively set at somewhere between 9 and 12 foot-candles. Perhaps the margins were too wide, but it was recognized, even then, that the theaters vary and that there is an upper limit to what the present equipment can provide. Furthermore, there is great reluctance on the part of those theaters that easily exceed the limit to come down to it.

Perhaps you might conclude from your experience at the Music Hall that the intensity in all theaters and reviewing rooms should be reduced to 7. It seems a shame to reduce all the theaters, if a bright screen is desirable, to the lowest level in order to attain uniformity. I believe, therefore, that there is some justification for studying the auxiliary factors comprehensively in order to arrive at what should be our highest goal. All the work of the Committee is aimed toward a better specification of screen brightness and, consequently, toward giving you the opportunity of making the print densities and contrasts do the best possible job. I hope we shall move rapidly toward that end and with your good aid and cooperation.

MR. HARDY: I am just a little fearful that Mr. Leshing may take back to

Hollywood the wrong picture of what has occurred at this meeting. This is a meeting of technical experts, and the language used is the shorthand of technical expression. We understand one another in those terms and it is a convenience to use the terms. I do not think it was the intent of this meeting to arrange any general set of recommendations for the industry. That can be brought about only after the subject has been discussed in all its phases.

One difficulty is that scientific results come slowly. Science insists upon the fundamentality of the result and it takes time to collect the fundamental data. The charge that is always made against the scientist is that he deals with things that are not practical. We must steel ourselves to that charge. I imagine that at one time when an astronomer studied the spectrum of the sun and discovered a new spectral line and gave the name of helium to the element that produced it, he was regarded as a rather impractical sort of fellow. Later when helium was discovered upon the earth and was used to fill dirigibles, it was regarded a very practical application.

Since the introduction of sound, the motion picture industry has adopted a great many concepts that before the advent of sound were regarded as very theoretical. Now that industry has adopted them, they have become very practical, indeed, and I think, therefore, that we can look forward to the adoption of many of the ideas that have been expressed here today. The language can, of course, be simplified. The logarithms do not have to be mentioned; the results can be put into very simple terms.

MR. SETTE: One of the statements that I read from Mr. Wolf's paper appears to have been taken as more inclusive as well as more conclusive than it was intended to be. The statement was: "Practical considerations lead us to believe that there is nothing *radically* wrong with the values of theater and screen illumination in common use."

Although it was not made clear, the statement was intended to refer mainly to the visual comfort of the audience observing the performance. Our impression has been that complaints in that respect are not so common as they would be were the situation really bad. If the scenic values of a picture are partially lost in projection, that is something else again, and is not necessarily due to inadequate screen illumination. If the latter were the case, the available data would indicate that the effect would vary with viewing distance, and that satisfactory conditions would obtain for the nearer seats, except for woefully inadequate illumination. Articulate complaints regarding poor contrasts or other scenic qualities of a projected picture would depend upon the level of appreciation to which the public has been educated. Engineers actively engaged in motion picture work would be more consciously critical and would demand a closer approximation to perfection, as Mr. Leshing does.

Referring once more to the statement to which exception was taken, it is evident from its form and from the associated text that it was not intended to apply with syllogistic accuracy. The paper concluded that some improvement could be made in theaters by stricter application of already existing information.

In regard to Mr. Schlanger's remarks as to poor observation from the rear of large theaters, I fail to see how we can do much about it in existing theaters with available equipment. In future theaters, careful architectural design can do much

to remedy the condition. The problem is a universal one, and should be as serious in auditoriums, stadiums, *etc.*, as it is in motion picture theaters.

MR. SCHLANGER: Viewing distances can, and must, be reduced.

MR. MITCHELL: Mr. Cook, does your formula apply to incandescent illumination? As I understood your statement, you referred primarily to 35-mm., where the size of the aperture was one factor and the size of the arc crater another. Would the formula apply to 16-mm.?

MR. COOK: When you speak of incandescent lamps, there is another thing to be taken into consideration, and that is the fact that the tungsten source is not a perfectly solid one. I have no figures here on the instrinsic brightness of tungsten, but I believe it is of the order of 27 candles per square millimeter. (The figure should be 49–58 c. per sq. mm. for biplane lamps used with a mirror.)

The estimate of screen brightness that I have attempted covers only the use of arc lamps with standard 35-mm. apertures. By substituting new dimensions for other sources or aperture sizes it could be made to apply to tungsten lamps or to 16-mm. film.

MR. MITCHELL: Mr. Tuttle, has any consideration been given to using your test apparatus to check distribution across the screen? I should like to refer again to the investigations that are being conducted by the Non-Theatrical Equipment Committee. In our last report we summarized the German recommendations, in which it is stated that the range of brightness from the center to the side of the screen should be fifty per cent. In the work of my company we have tended to reduce the variation to fifteen per cent, which is quite a difference. Although we have no exact data, I believe it is recognized that if one is close to the screen, he can endure a hotter spot at the center of a picture than if he is farther away.

I offer the suggestion that possibly some kind of movable vignette might be used with the test-screen to obtain some comparative data as to the most desirable distribution of light across the screen. I feel that this matter is of greater importance than is generally recognized.

MR. TUTTLE: I think Mr. Mitchell's suggestion is very interesting. We shall consider it.