SECTION B — Discussion: Photographic Materials and Optical Components

Note: A Participant's full name and address are given with his first contribution to the Discussion. Authors' full names and addresses are given with the title of each paper. For subsequent entries the addresses are omitted.

Paper B-1: Flash Light Source Measurement, *George H. Lunn*, Atomic Weapons Research Establishment, Aldermaston, Berkshire, England.

Dr. J. S. Courtney-Pratt (Bell Telephone Laboratories, Murray Hill, New Jersey): Has any work of this kind been undertaken as yet at even shorter exposure times?

G. H. Lunn: The present equipment uses an electric motor drive for the rotating mirror which gives a time resolution of 10^{-7} sec. At AWRE we have other drive systems, for example, air turbines, which can give higher speeds to give time resolutions up towards 10^{-9} sec. These drives can easily be fitted as desired — the limitation may be the system aperture, as even with such a fine arrangement as the Brixner Camera, optical aperture is still a problem. The paper given today was intended only to show that the method is practical and not to cover all applications. For example, at the moment, the light intensities are quoted on a relative scale. While higher speeds are most interesting, it is proposed to run at progressively lower speeds in order eventually to make the light intensity figures absolute — i.e. by recording standard light sources using the same technique. The aim is to give results all based on the same method such that relations between films and sources are precise.

Maxwell A. Kerr, (Perkin-Elmer Corp., Main Ave., Norwalk, Connecticut): What is the effect on density range and gamma of shortened exposure at high intensity, i.e. how noticeable is reciprocity law failure? Very little data of this type is available for microsecond and millisecond exposure times.

G. H. Lunn: The curves shown were produced at 10^{-7} sec. — i.e. very short exposures — and the graphs show that the image density range is very similar, if not identical, with those obtained at normal exposure times.

Charles W. Wyckoff (Edgerton, Germeshausen & Grier Inc., 165 Brookline Ave., Boston, Massachusetts): Have you made such records as described in your paper using color film in place of black-and-white? It is of interest to know whether or not you have detected any change in color of the light pulse as a function of time between the peak and tail.

G. H. Lunn: It is intended to use this equipment fitted with some spectro-dispersive element to study color/time changes. A lower-speed, time-resolved spectrograph is now being used, but it is too early to quote results. It is appreciated that there are many applications of this system and many years' work are involved.

Lincoln L. Endelman (The Martin Company, Cocoa Beach, Florida): Has this method been applied to other types of flash source, such as argon-filled tubes rather than xenon-filled tubes?

G. H. Lunn: Other light sources have been examined including spark gaps, but I am not yet ready to quote results. Such studies will be made and reported in the future. It is intended to publish the results as a collection of graphs as they become available.

Paper B-4: High-Speed Direct Recording Papers, *Heman D. Hunt*, Parlin Research Laboratory, E.I. du Pont de Nemours & Co., Parlin, New Jersey.

L. L. Endelman: We have attempted to use this more sensitive paper in conjunction with a CEC Data Magazine, and have found the resolution characteristics to be very poor. Could you comment on this?

H. D. Hunt: Resolution appears lower with high-speed materials because of the optics of the oscillograph rather than the emulsion characteristics. The spot of light generally has a fringe due to imperfect focus which results in a wider trace than we expect. Resolution improves in this case as the writing speed increases.

Paper B-5: A Comparison of High-Speed Photographic Films With Different Vigorous Development Conditions, *Zev Pressman*, Stanford Research Institute, Menlo Park, California.

George J. Woffinden (Aerojet General Corporation, Covina, California): Was any attempt made to correlate grain size with relative film speed?

Zev Pressman: Yes. However, it wasn't part of this paper. We made 20× enlargements from each original film listed in the comparison table in the report. The fastest films had coarse grain, as might be expected. However, ample detail was evident and overall sharpness was sufficient for our purpose. Owing to the fact that Royal-X Pan Recording Film was not forced as much in processing as the other films, its naturally coarse grain was not exaggerated as were some of the other films.

G. Woffinden: Were any very-fine-grain films investigated?

Zev Pressman: No. We didn't make any direct comparisons with the Plus-X or new Double-X films that are out now. We were only interested in speed, and for general-purpose work.

Dr. Karl-Heinz Lohse (Aeronutronic Division, Ford Motor Company, Newport Beach, California): Did you compensate for the specific spectral sensitivity of the film during your sensitometric exposures?

Zev Pressman: Yes. We found a certain opal glass had a spectral transmission value approximately equal to the Kodak 81B *or* C color temperature correction filter. This was sufficient, for our purposes, to produce the equivalent of noon sunlight or normal daylight. The xenon flash alone was slightly higher in color temperature when used with plain ground glass as diffusers.

This didn't mean too much to us because our exposure light sources have an entirely different color temperature.

C. W. Wyckoff: I would like to ask Mr. Pressman if any of his tests have included Kodak Rapid X-ray Developer; and if so, what were his findings?

Zev Pressman: The only x-ray developers used in these tests were the two we normally use for our high-speed x-ray films.