Letters to the Editor

Re: Three-Dimensional Motion Picture Nomenclature

[from L. Dudley]

I would like to refer to my letter, and Major Bernier's reply thereto, which appeared in the *Journal* for July 1952.

With regard to a suitable term to define those stereoscopic processes which do not entail the use of individual viewing devices, I think that the term *autostereoscopic* processes is as good as any. This term is in fairly general use in England, and equivalent terms are gaining some ground on the continent. Further, on the writer's recommendation, it has been adopted by the British Standards Institute.

I notice that Major Bernier has repeated some of the information, concerning early pioneers, which I gave in my own letter, but has made one or two errors in this connection. For example, the particular member of the Ives family who is associated with the year 1902 is, as stated in my letter, Frederick Ives (the inventor of the parallax stereogram), and not his son, Dr. H. E. Ives, as inferred by Major Bernier. Dr. H. E. Ives's most important contributions to the art lie in his various proposals for applying the principle of the parallax panoramagram (invented by C. W. Kanolt in 1915) to stereo cinematography.

Referring to the seventh paragraph of Major Bernier's letter, it would appear that Major Bernier agrees that "accommodation" is the correct term, rather than "focus reaction," so it is a little difficult to follow his reason for believing that the latter term would be more easily understood.

With reference to the comments in paragraphs 8 to 10 of Major Bernier's letter, here again I am at a loss to follow his reasoning. My statement to the effect that stereoscopic vision is the net result of the various contributing factors is not based on a fallacy, for the very good reason that my definition of the term is that which is generally accepted. Further, the fact that binocular vision does not always result in the perception of a three-dimensional (or stereoscopic) image has not been in question, so I do not understand why Major Bernier cites several examples to illustrate this point. By so doing, Major Bernier is, in fact, arguing on my side, because he is agreeing that, whilst binocular vision does not always result in the perception of a three-dimensional (or stereoscopic) image, we cannot experience stereoscopic vision *without* binocular vision. Accordingly, the latter factor must be regarded as one of the contributory causes of the former.

I am familiar with the work of Hardy and Perrin, to which Major Bernier refers, and agree that in most circumstances the faculties of accommodation and convergence are interdependent. Such interdependence exists during the viewing of motion pictures, as can be demonstrated experimentally by photographic methods. In my previous letter, when discussing the phenomena causing cinema patrons to make periodic, momentary efforts to accommodate for the "apparent" plane of the image, I stated that this "is sometimes the cause of headaches amongst elderly cinema patrons, whose ocular sensory organs and muscles are, naturally, less responsive than those of younger people." I am very surprised, therefore, to note Major Bernier's comment that he cannot agree with this "since it is common knowledge in ophthalmic practice that they lose their power of accommodation as a result of progressive hardening of the crystalline lens as they grow older." Here, again, it would appear that Major Bernier is not really disagreeing with me, because we are, of course, both in agreement about the progressive deterioration, with age, of the power of accommodation. The important point is that the *effort* to accommodate does not undergo the same, progressive deterioration, and it is the persistence of this effort, regardless of the fact that the organs concerned are no longer fully responsive, which results in strain.

I note that Major Bernier claims to have overcome completely the time parallax problem associated with the alternate frame principle. I would therefore draw attention to the fact that, by definition, an alternate frame system is one in which the

"left-eye" and "right-eye" views are recorded *alternately*. Accordingly, the phenomenon of time parallax is inherent in such systems. In order to eliminate time parallax, the two components of each successive stereoscopic pair must be recorded *simultaneously*, which means, of course, abandonment of the alternate frame principle.

Referring to the penultimate paragraph of Major Bernier's letter, my statement that "the *minimum* rate of occultation necessary to prevent the occurrence of *objectionable* flicker is about 24 per second" is quite correct. In my previous letter I was not referring to the rate of occultation which would be acceptable in a practical system, as the acceptable rate is influenced by screen brightness, picture contrast and other factors. In a practical system the rate of occultation must be sufficiently high to cope with the most severe conditions, necessitating doubling or trebling the minimum rate.

September 16, 1952 L. P. C. J. Dudley
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[from John A. Norling]

I have reviewed with interest Mr. L. Dudley's letter of 30 August 1951, Major Robert V. Bernier's letter in reply thereto and Mr. Dudley's comments of 16 Sept. 1952 on Major Bernier's later communication.

These letters confirm my opinion that the Stereoscopic Art needs an authoritative nomenclature, a nomenclature that will make it possible for all authors who will follow it to "speak a common language." It is my hope that the Stereoscopic Committee will soon produce a Glossary of Terms acceptable to all workers in the field. There exist many phases of the art which have been given various terms by different people and there are no textbooks on ophthalmology and optometry which completely cover the field. However, we should not change a term from its established use merely because we think we can express ourselves more clearly than the textbooks have succeeded in doing.

I agree with Mr. Dudley that "*accommodation*" should be used rather than Maj. Bernier's "*focus reaction.*" The term "*autostereoscopic* process (es)" is much to be preferred to the loose term "*composite process* (es)." Composite processes of photography are not part of the stereoscopic art; in fact the familiar "Composigraph," employed extensively in the past as a journalistic stunt, is something that would result only in a confusing stereo movie, if it could be made at all.

An interesting thing about projected stereo is that it calls for a relaxation of accommodation but an active use of the muscles employed in convergence. For this reason it seems advisable to use extreme restraint in employing photographic stunts that require the viewer of projected stereo excessive use of his faculty of convergence. Eyestrain may arise if wide uncoupling of accommodation and convergence are demanded of people.

I agree with Mr. Dudley that the time parallax problem associated with the alternate-frame principle is a serious one, particularly if the individual members of the stereo pairs are photographed alternately. But even if the individual members are photographed simultaneously, alternate projection will almost certainly result in eyestrain, regardless of the projection frequency.

The eyes, or perhaps more properly the visual centers, do not like the delivery of a picture to one eye during an occultation of the other eye. I have observed symptoms of nausea even at projection of 48 frames a second, 24 to each eye, and a flicker frequency of 192. I have used the term "differential flicker," for want of a better term, in discussing the particular problems in alternate-frame projection. Flicker fusion frequency (fff) is a very important matter in ophthalmology and medical practice. Detection of the change in fff in an individual is often of great value in diagnosis.

In connection with fff, research has demonstrated that the average is around 45 to 48 cycles/sec and doesn't vary much with age, but tests for fff are made with a beam of light subtending one degree or less and covering only the fovea, where, as we know, there is less sensitivity to rapid changes in light than in the outer regions of the retina. The motion picture

is seen by quite a large area of the retina and a fairly bright picture usually has a detectable flicker at 96 interruptions a second, 48 periods of brightness and 48 periods of darkness, as occur in projection with a two-bladed shutter at 24 frames/sec. A very limited study of the flicker problem has convinced me that alternate-frame projection of stereo has serious drawbacks. Therefore I cannot agree with Major Bernier's conclusions nor with Mr. Dudley's statement (in his 30 Aug. 1951 letter) that "It is readily demonstrable that the minimum rate of occultation to prevent the occurrence of objectionable flicker is about 24 frames/sec, etc.," even though he confines this to planoscopic projection and even though he qualifies this statement in the last paragraph of his letter of September 16, 1952.

October 1, 1952

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The following members have been added to the Society's rolls since those last published. The designations of grades are the same as those used in the 1952 MEMBERSHIP DIRECTORY.
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Agar, H. V., Sales, Watland Brothers. **Mail:** 535 North Brainard, La Grange Park, Ill. (A)

Arthur, Hal, University of Southern California. **Mail:** 8569 Nash Dr., Los Angeles 46. (S)

Barkes, Gordon S., Projectionist, WBKB Television Station. **Mail:** 4170 West Nelson, Chicago 41, Ill. (A)

Belsky, Clarence J., University of Southern California. **Mail:** 430½ South Burlington Ave., Los Angeles 5, Calif. (S)

Benns, William E., Jr., Consulting Radio and Television Engineer, 3738 Kanawha St., N.W., Washington, D.C. (M)

Bonner, Bob, University of Southern California. **Mail:** 2326 Scarff St., Los Angeles 7. (S)

Brokaw, Edgar L., Jr., Lecturer (Motion Picture Editing), University of California at Los Angeles. **Mail:** 129 South Oakhurst Dr., Beverly Hills, Calif. (A)

Brokop, Robert J., University of Southern California. **Mail:** 1130 West 36 St., Los Angeles 7, Calif. (S)

Browne, Robert A., University of Southern California. **Mail:** 836 W. 41 St., Los Angeles 37, Calif. (S)

Caldwell, S. W., President, S. W. Caldwell, Ltd., 150 Simcoe St., Toronto, Ontario, Canada. (A)

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Colman, Joel E., University of California at Los Angeles. **Mail:** 3267 Sepulveda Blvd., Apt. 1, Los Angeles 34, Calif. (S)

Cowles, William E., Mechanical Engineer; Groupleader, Engineering Visual Aids., General Electric Co. **Mail:** 1556 Clifton Park Rd., Schenectady, N.Y. (A)

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