stance, the calibrated focal length); angles of field and distances recorded on a plate are easily measured, the first ones with an accurate goniometer, a long focal length collimator and an autocollimation method, and the second ones with an accurate measuring machine. On the other hand, it is well known how difficult it is to measure focal lengths with high precision. One end of it is pretty easy to determine; the end on the plate side. The other end is poorly defined and its position may appear to vary according to the angle of field. As a matter of fact, I consider that the main cause of distortion inside a perfectly centered system is precisely to be attributed to the spherical aberration of the centers of the entrance and exit pupils, so that distortion is mainly due to variations of the object and image pupillary abscissae. When the concern is the whole camera, instead of the unmounted lens, the interest of considering distances on the plate and angles of field in the object space is still more obvious.

My second remark concerns the interest —discussed in the paper delivered to the Hague Congress—of the visual examination of a square grid, through the lens under test, with a photogoniometer. Shapes of the transformed curves (on the distortion diagram) of straight lines of the grid which do not go through the center of the grid, give a direct and suggestive representation of deformations of the model of the terrain which may be expected from the lens distortion.

COMMENTS BY MR. LEWIS

Arlington, Virginia
December 7, 1956

Chief Engineer J. Cruset
122 Blvd. Murat, 122
Paris 16, France

Dear Mr. Cruset:

I can appreciate your surprise at seeing something old in your country presented as something new in an American publication. I sincerely did not know until recently that you used the variation of focal lengths to represent distortion. I don't recall discussing this when you were here in 1951. The article in PHOTOGRAMMETRIC ENGINEERING was originally given as a talk at the 1955 meeting of the American Society of Photogrammetry. Since you have given references to your work by letter to the *Editor*, PHOTOGRAMMETRIC ENGINEERING, I feel sure this information will be brought before the readers of the magazine.

The real aim of the work I did on this subject was to obtain a quick approximate method for determining the effect of lens distortion on the stereoscopic model. The discussions of definitions and current methods of measuring distortion were formed around the current practices in America as evidenced by definitions accepted by The American Society of Photogrammetry and by numerous articles in PHOTOGRAMMETRIC ENGINEERING on the subject of camera calibration.

I am glad to learn that your method of plotting distortion is gaining favor in Europe. I hope for its adoption in America.

Yours truly,
JAMES G. LEWIS