PAPER E—5

Hexagonal Lenslet Arrays

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A NEW METHOD OF preparing lenticular plates, developed in the Soviet Union in 1948, was reported at the Fourth International Congress on High-Speed Photography in Cologne in 1958.

Since 1958 the authors of this paper, at the All-Union Scientific Research Institute of Cinematography, have developed a new method employing a rotating diaphragm, which makes it possible to produce lenticular plates with any focal length, within wide limits.

Measurements of samples, prepared by the new method, show that their resolving power is increased at the same time as the relative aperture is increased. For example:

The resolving power, $R = 130$ lines/mm for $2a/F = 1{:}10$; $R = 350$ lines/mm for $2a/F = 1{:}3.4$; $R = 530$ lines/mm for $2a/F = 1{:}2.3$.

Here $2a$ is the diameter of each lenslet, and F is its focal length.

The capacity of the lenticular plates is given by the following equation $E = t^2R^2$; and, in accordance with the figures above, can be as high as 7000 or 9000 images.

Here E is the capacity of the lenticular plate. This is the number of separate images that could be recorded behind a lenticular plate without double exposure. It also is equal to the number of image elements that can be resolved behind any one lenslet. t is the pitch spacing of the lenslets; R is the resolving power.

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At the present time hexagonal lenticular plates of the following parameters are prepared in the Soviet Union:

Parameters	Pitch spacing t of the lenslets in a hexagonal coordinate system	
	0.70 mm	0.44 mm
Permissible variation in pitch of lenslets (mm)	0.010	0.005
Lens diameter $2a$ (microns)	500	350
Relative aperture $2a/F$	to $f/3$	to $f/3$
Focal length F (mm)	1.5	0.8
Visual resolving power R of the lenslets (lines/mm)	to 500	to 500
Focal stability for plates from 9 × 12-cm to 60 × 60-cm	from 2% to 5% F	from 2% to 5% F
Thickness of glass (mm)	3–5	2–3

The use of lenticular plates as stereo-screens makes it possible to increase the brightness of images as compared with the use of simple slits tens or hundreds of times. Their use in photography also allows one to use objectives of low illuminating power.

The use of hexagonal lenticular plates is not limited to high-speed image dissection cinematography. Integral stereo-photography, live photography, stereoscopic color television, polygraphy are some of the many other fields where hexagonal lenticular plates can find efficient application.