

as evidence for the view that these two effects may be brought about by the same pituitary factors.

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¹ Frazer, A. C., and Stewart, H. C., *J. Physiol.*, **90**, 18 (1937).

² Frazer, A. C., Stewart, H. C., and Elkes, J., *J. Physiol.*, **95**, 68 (1939).

³ Stewart, H. C., *J. Physiol.*, **101**, *Proc.* (1942).

Binocular Focusing on a Repeating Pattern

SOME correspondence appeared in NATURE in 1938 about the phenomenon described by Brewster¹, which is obtained by focusing on a surface covered by a repeating pattern while converging on a point nearer than, or beyond it, so that the images of different units of the pattern fall on corresponding points of the two retinae. Paget² found that when he converged, the patterned surface seemed to approach to the position of the point of convergence, the units appearing correspondingly smaller. This experiment has now been tried on eight subjects, and Paget's result only obtained with four of them. They were asked to estimate, and then indicate with a ruler the distance and size of the pattern. Two saw the images at the distance for which they were focusing, however much they squinted, and two saw them in a rather indeterminate intermediate position.

The divergent results of previous investigators of the factors underlying judgments of absolute distance seem to be due partly to differences in their experimental methods, and partly to the very limited number of subjects studied. It can be shown by using only a tiled floor or striped wallpaper, a tape-measure, and a piece of thread, that the estimate of absolute distance can vary widely with the subject and the conditions of the experiment. A satisfactory arrangement for such an experiment must provide that: (1) the illumination is constant; (2) the size of the retinal image is constant; (3) the object to be observed can be clearly focused; (4) the object fills the whole visual field so that there is nothing else with which to compare it; (5) the distance of the 'marker' used to indicate the position of the image can be accurately judged; (6) the 'marker' is not visible until the position of the image has been judged, otherwise estimates are purely relative. The apparatus of Carr and Swenson³ neglects point 3, that of Grant⁴ point 5, and that of Fischer and Löwenbach⁵ points 4 and 6.

The repeating pattern fulfils all these requirements; the difficulty arises in choosing a suitable 'marker'. If a piece of thread was used, the apparent position of the pattern varied according to whether the thread ran sagittally or from right to left. In the latter case, when the thread could only be located by focusing, two of the subjects could not tell where it or the images were; but all who could make a judgment in both sets of conditions located the images nearer the point of convergence with the thread running sagittally, and therefore easy to converge upon. The two 'focusers' still saw the pattern well beyond the point of convergence. When one of the 'intermediate' subjects, who usually located the image not far from the plane on which he was focusing, held the thread sagittally at the point of convergence, he found that the pattern "floated up and sat on it", dropping down again when he removed the thread. An apparatus which uses as a 'marker' a vertical

rod visible all the time therefore begs the question. The type of pattern used also affects the results; the two subjects who tested this point located vertical lines nearer the eye than a diagonal grid.

When the subjects were given a rough test for their stereoscopic acuity, their quickness and accuracy varied directly with the degree to which they used convergence for assessing distance. Variation in the observers and in the type of floating mark or grid used in the apparatus may be of importance in the interpretation of air photographs.

In my view, contrary to most recent opinion, fine stereoscopic discrimination, in some people, does depend on small changes of convergence. It is hoped to make some more refined experiments to investigate this point.

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Newcastle upon Tyne. Nov. 18.

¹ Brewster, D., *Phil. Mag.*, **30**, 305 (1847).

² Paget, Sir R. A. S., NATURE, **142**, 77 (1938).

³ Swenson, H. A., *J. Gen. Psychol.*, **7**, 360 (1932).

⁴ Grant, V. W., *J. Exp. Psychol.*, **31**, 89 (1942).

⁵ Fischer, M. H., and Löwenbach, H., *Pflüj. Arch. ges. Physiol.*, **236**, 607 (1935).

J. B. Hannay and the Artificial Production of Diamonds

IT seems to be a well-established fact that Hannay did make diamonds, and as the result of an investigation which, in my memoir¹ of him, I described as difficult, and carried out in a masterly manner. That work like this would be scoffed at, and the mere evidence that could be put forward at the time discounted, was to be expected. It will be remembered that, when the discovery of argon was first announced, there were plenty of critics ready to suggest that the announcement was made on altogether insufficient evidence, and to commit themselves to observations which no one would attempt to justify to-day.

It seems to me to be unfortunate that an attempt should be made² to justify Hannay's critics, rather than to find in his other investigations evidence that he really was no mere inventor, but a very clever investigator, who came to his discovery as the result of clear reasoning, followed by well-planned and boldly executed experiments. No one who has read his papers on the continuity of the gaseous and liquid states can fail to come to such a conclusion; and many of his minor investigations show insight and exceptional experimental skill.

Now there is a very definite reason why Hannay did not reply to the criticism to which Lord Rayleigh refers. In the middle 'eighties, before he was thirty years old, Hannay had entirely abandoned what may be termed academic experimental work, and thrown himself into industrial research. What he did, he put his whole heart into; and if the criticism came to his notice, it is scarcely to be imagined that it would interest him.

However, why should Hannay 'fake' a result of this kind? The letter from Ramsay to McGowan, which I publish in my memoir, shows that Hannay not only used but also made the apparatus referred to. The general experience is that errors of this kind are accidental; and as a matter of experience, we all make mistakes, even the youngest of us.

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¹ *Chem. and Ind.*, **17**, 507 (1939).

² NATURE, **152**, 597 (1943).