

I wish to express my sincere thanks to Sir Lawrence Bragg for his suggestion of this problem and for the keen interest he took in the work; also to Mr. P. Y. Hwang, who made the final adjustment of the parameters in the structure.

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¹ *Vü. NATURE*, **141**, 158 (1938).

Mechanism of Metallic Friction

DR. BOWDEN and his collaborators¹ in their investigations on the mechanism of metallic friction need have little doubt that, under many of the conditions of load and speed used in practice, the local temperatures reach a high value. Very high local temperatures are attained in very short intervals of time, as those who have observed 'seizure' taking place between the cylinder or liner and piston in an internal combustion engine can testify. The opportunity of witnessing this occurrence is rare in modern engine design with closed crank cases, but in the days of the horizontal gas engine, with the open-ended cylinder and trunk type piston, high temperature, often a white heat, was frequently observed when 'seizure' took place.

Probably at that time before the days of ground finishes, 'seizures' on the test bed were a more frequent occurrence. The dimensional accuracy of the 'fit' allowances, in addition to the character of the wearing surfaces, which were finish turned and bored, contributed to this state of affairs. Engineers certainly relied very much more on 'running in' to establish satisfactory working surfaces. I recorded some observations on these matters in a paper before the Manchester Association of Engineers in 1916.

Examination of 'seized' surfaces of cylinders, pistons and rings showed 'flowed' failures, and I will remember our chief engineer in those days being profoundly convinced that such layers had been molten and consisted of metal melted during the 'seizure'.

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¹ See *NATURE*, **150**, 197 (1942).

Shape of Subjective Space

IN a discussion of blind spot phenomena, Bartley¹ raises the question as to whether points subtending equal visual angles are subjectively equally separated, and suggests that the form of subjective space is related to the density of the rods and cones in the retina.

A theory that each sense-cell (or rather each fibre of the optic nerve, where more than one cell converge on to one fibre) contributes equally to the formation of subjective space would find much evidence to substantiate it; for example, the apparent uniformity of the brightness of the visual field, in spite of the variations in population of sense-cells in the retina; variations in subjective velocity of bodies moving at constant velocity in the field of vision, etc.

The gross distortion of subjective space in the region of the blind spot, because of the lack of sense-cells in the optic disk, is well demonstrated by the subjective filling in of various incomplete figures made to fall across the blind spot, as described by Helmholtz and others.

A binocular phenomenon which I have recently observed has some bearing on this and related questions. If a stereoscopic photograph is examined, first so that the relief stands out, and then by inverting so that although the two halves fuse there is no stereoscopic effect, the objects in the picture appear to increase in size. If one eye is then closed, the original sizes return. Reversing the procedure gives opposite effects.

An arrangement of mirrors was set up so that the right eye would see from the point of view of the left eye, and the left eye that of the right, so that binocular fusion without relief would be obtained. Observers were asked to judge the lengths of slips of paper held successively in the field of view, first with one eye only and then with both eyes. Estimates of size in the two cases were in the ratio of 3 to 4; that is, there is an apparent magnification in area of almost two.

It would seem that binocular fusion without stereoscopic effect is equivalent to doubling the numbers of active sense-cells and consequently the subjective size, while where stereoscopic vision is concerned some sort of unification of corresponding sense-cells in the two eyes takes place so that they behave as one—a possible explanation also of Fechner's paradox.

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¹ Bartley, S. H., "Vision: A Study of its Basis" (London: Macmillan and Co., Ltd.), p. 114.

Role of Adenine Nucleotides and Growth Factors in Increased Proliferation following Damage to Cells

STIMULATION to tissue repair in wound healing has been attributed variously to polypeptides and amino-acids¹, sulphhydryl compounds², nucleoproteins³, fatty acids⁴, or certain nucleic acid derivatives⁵, and it has been proposed that the stimulating substances are secretions of leucocytes ("trephones"⁶) or damaged-cell disintegration products ("wound hormones"^{7,8}). Since cell secretions or damaged-cell products influence normal cells through the intercellular *milieu*, a direct and quantitative approach to this problem is afforded by the comparison of intercellular fluids from damaged cells (I) and from normal cells (II), with regard to their chemical composition and effects on cell metabolism. Such comparisons have shown that (I) greatly exceeds (II) in stimulating cellular proliferation^{6,7} and respiration^{8,9} and in increasing capillary permeability¹⁰, and that when (I), but not (II), from animal tissue sources is injected repeatedly into animals, overgrowths result⁷.

In the following experiments, cell-free, injured-cell suspension fluids (I) and normal-cell suspension fluids (II) from yeast suspensions (*S. cerevisiae*, F. B. Strain, 100 gm. per l. in distilled water) were compared. Injury was by 8 hr. sublethal ultra-violet irradiation¹¹, which produced negligible cytolysis, but