as opposed to the reflex nature of the primary response.

This method has made it possible to sort out the various occurrences in the seemingly very rapid responses following the gunshot. In the infant it is possible to differentiate between the primary startle pattern and the Moro reflex. In the adult we can separate the primary reflex response from the "voluntary jumping," etc. In patients showing Parkinsonian tremor the ultra-rapid photography shows a very brief cessation of the tremor after the gunshot, during which period the elements of the startle pattern appear, followed by resumption of the tremor.

While much can be done, as we have shown, with the relatively small magnification provided by a camera speed of 64 exposures per second, there is much more to be obtained at higher camera speeds. We have now begun to work with cameras capable of running as fast as 3,000 exposures per second. At present, we have results at speeds of 700 and 1,500 exposures per second. We have applied these speeds to the problem of voluntary facilitation of the reflex startle response. With the naked eye, it is impossible to separate the original response from the voluntary facilitation. At both 700 and 1,500 exposures per second, the two can be clearly separated. The primary startle pattern appears first; there is an appreciable interval; and then the "facilitation" appears as a separate response. The uses of this technique in revealing the interrelations of voluntary and involuntary response are evident. A feature of these special cameras is a timing dial included in the photographic field which may be read directly to 0.002 seconds.

The magnification of time in this fashion raises interesting perceptual problems. The dimension of time is an important determinant of the "form quality" or "gestalt" of any experience. The distortion of this one dimension may be sufficient to change the quality of the perceptual pattern. Thus, the facial elements of the startle pattern at normal speed, four times slower than normal, and fifty times slower than normal, are three qualitatively different expressions, their identity evident only if one knows the background of conditions under which the pictures were taken. The first is a "jerk," the second resembles a "hiccup," and the third a stretchy yawn. All three involve the same response with only the speed of presentation changed. Thus, the technique of temporal magnification offers a new approach to the study of time as a factor in perceptual organization.

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CELL INCLUSIONS IN AZOTOBACTER CHROOCOCCUM BEJ.

In a recent issue of this journal[1] I. M. Lewis, discussing the work of Jones, Löhnis and Smith, Mencl, Prazmowski and of Schmidt on the nature of the stainable granules in the cells of *Azotobacter chroococcum*, writes: "There is no indication that any of the other workers performed microchemical or solubility tests to determine whether the stainable bodies are living entities of the cell or lifeless cell inclusions which function as reserve food." He further states that his own investigations showed these to be composed of volutin.

Solely in the interest of truth and as a corroboration of the results reported by Lewis, it may be of interest here to mention a publication of the present author[2] in which, after a long series of microchemical and solubility studies, the writer concludes that "the granulations take the basic dyes and are constituted neither of fats nor glycogen, starch nor chromatine. They seem to be of a metachromatic nature." . . . and that "there is no doubt that metachromatic or, as Meyer terms them, volutine granules were found."

The reserve nature of these bodies was further demonstrated by the preesnt writer[3] by a study of their autophagy.

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SCIENTIFIC BOOKS

STATISTICAL MECHANICS

Statistical Mechanics. By R. H. Fowler. 864 pp. Cambridge: at the University Press. New York: The Macmillan Company. 1937. $14.00.

The first edition of this monumental work, which appeared in 1929 and which we reviewed in this journal,[1] is already a classic in the literature of theoretical physics. So it will suffice to describe the respects in which the second edition differs from the first, both in the presentation of general principles and in the applications to particular problems. The increase in size is immediately apparent. We have always thought the author must have been almost a superman to write a volume as comprehensive as the first edition on such difficult subject-matter. Now, however, the number of pages has grown from 570 to 864, and of numbered equations from 1,607 to 2,344!

[1] J. H. Van Vleck, Science, 70: 41, 1929.

[1] Science, n. s., 85: 16, 1937.
[2] *Jour. Agr. Res.*, 4: 225–239, 1915.
[3] *Jour. Bacter.*, 6: 331–359, 1921.