blue all at once, if it is seeing them in (in some sense) equal amounts. This view is in itself so indefensible on the ground of ordinary common sense that it looks like rather a waste of ammunition to attack it with experiments. But while the argument here brought out against that theory is not wholly necessary, neither is it thoroughly conclusive. It is true that it is not permitted to explain the anomalous cases of total color-blindness here described as due to defects in the optic nerve or in the higher centers; for if there is any difficulty in the transmission of the color process from retina to brain, then the sense for the mixed white of the fovea would vanish at the same time as the sense for color. But, as we have pointed out, there is nothing in the way of supposing that there are rods in the fovea which are lacking in the visual purple which is characteristic of the rods of the mid-periphery. With this supposition, the theory of v. Kries is not much worse off than it was before.

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Ueber Raddrehung, Rollung und Aberration. A. MEINONG. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane.* Bd. XVII., Hf. 3, p. 161.

Discussions of the laws of ocular movements are always difficult, and often obscure, when they come to deal with the movements of torsion. The treatments of this part of the subject by different authorities have resulted in conclusions that are not readily comparable, and frequently these conclusions seem to be contradictory. Meinong has succeeded in this article in clearing up the matter by defining more fully the various aspects of such movements, and by assigning to each, as its distinguishing name, one of the terms that have been used more or less loosely as synonyms to refer to the movement in general. English terminology is in this case no clearer than the German, and this is a favorable opportunity for improvement by adopting, as far as possible, terms equivalent to those proposed by Meinong.

Movements of the eye may be defined according to their axes as follows: first, movement about a horizontal axis; second, movement about a perpendicular axis; and third, movement about the line of regard as an axis. Other complex movements can be reduced to these three as component movements. If, now, any actual movement contains a component belonging to the third class we have in this component a true movement of (*Rollung*) torsion. In certain complex movements, as, for example, in movements from the primary position, torsion is not present. If, however, instead of passing directly from

the primary position to a point situated obliquely above or below, the eye moves first on its perpendicular, and then on its horizontal axis, the latter movement will be accompanied by torsion.

From this movement of torsion are to be distinguished two changes in the relative position of the retina. The first is a deviation of the perpendicular meridian of the retina from the objective perpendicular. This failure of the perpendicular meridian of the retina to correspond to the objective may be designated (*Aberration*) aberration. It may appear, as, for example, when the eye is moved obliquely from the primary position, even though no torsion has taken place. Finally, if in any position of the eye the planes of regard and of the retinal horizon do not coincide, the angle between them may be called the angle of (*Raddrehung*) rotation. The term torsion applies, then, to actual movement, while the terms aberration and rotation refer to angles of position.

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Zur Theorie der räumlichen Gesichtswahrnehmungen. Von W. WUNDT. Philosophische Studien, Vol. 14, pp. 1-118.

The question as to the origin of the spatial character of sight is here treated in an article which is indeed attractive and certain to stimulate considerable discussion. The mode of procedure is, in the main, strictly empirical; the author devotes himself to a leisurely review of certain facts which seem to him to put us in a position where a decisive answer can be given to the problem in hand.

As part of the data on which his conclusions are based, Wundt gives the history of his own remarkable case of retinal disturbance, due to a diseased condition of the underlying tissues (*choroiditis disseminata*). Irregular displacements of the retinal elements occurred and were accompanied by an apparent distortion of objects in view. In time, however, this distortion passed away, and while, as Wundt points out, it is not impossible that the displaced parts may have returned to their original positions, this seems, under the circumstances, highly improbable. The indications were that these parts remained displaced and finally became functionally adapted to their new positions. For it is evident from other cases, where a persistent refractive instead of a retinal disturbance has existed, that a functional readjustment can take place in the retina, and the earlier irregularity in the appearance of things entirely disappear. There is, therefore, no hard and fast spatial meaning attached to a particular retinal element;