The moment of inertia of the rod was determined, both by calculation and experiment, with very satisfactory agreement, and all the linear measurements of the apparatus, and of the distances, were made very carefully by horizontal and vertical cathetometers. Ingenious reflexion devices were used for measurements, which were made through the walls of the receiver.

Dr. Braun used both the deflexion method of Cavendish, and the oscillation method first used by Reich, to whom it was suggested by Forbes. In the deflexion method the attracting masses are placed outside the case, in such positions that their pulls on the attracted masses twist the rod round. The deflexion is observed, and the value of the corresponding torsion couple is determined by the time of vibration of the system. When the rod is deflected it does not, of course, take up its new position in a "dead beat" manner, but oscillates about it. The usual method of determining the centre of swing has been to observe successive elongations or turning-points, and by combining these in threes to eliminate the effect of decrement, and so to deduce the centre. But Dr. Braun found the centre more accurately by observing the times of transit of several scale divisions near the centre, in both directions. By interpolation he could determine the point about which the time of oscillation in either direction was the same, and this was taken as the centre of swing. The deflexion observed was about 13 divisions of the scale. The times of transit were registered on a chronograph.

The wire showed a certain amount of elastic after-action, and by subsidiary experiments on a similar wire this was as far as possible allowed for.

In the oscillation method the attracting masses are placed in a line with the torsion-rod, one at each end. Their attractions then act, not to deflect the rod, but to increase the restoring force, and so to lessen the time of vibration. The attraction is determined by comparing the times of vibration when the masses are in position, and when they are removed, or when they are placed so that the line joining their centres is at right angles to the rod.

The time of vibration observed by Dr. Braun was about 1275 seconds, and when the masses were put in position this was altered by about 46 seconds.

The results obtained in the years 1892 and 1894 were finally used, and these gave for the mean density of the earth—

	1892	1894
Deflexion method	5·529 ...	5·526
Oscillation ,, ...	5·520 ...	5·531

Giving due weight to the various observations, the final result is practically identical with that of Prof. Boys', viz.:

$$\text{Mean density} = 5\cdot52725 \pm \cdot0012$$
$$\text{Gravitation constant } G = 665\cdot786 \times 10^{-10}$$

J. H. P.

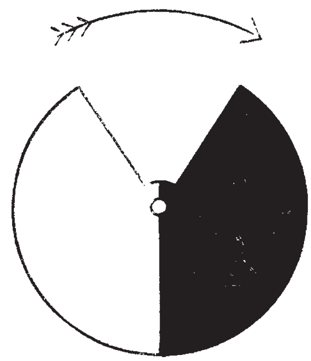
SUBJECTIVE TRANSFORMATIONS OF COLOUR.

IN a communication to the Royal Society on May 13, I described some curious experiments, showing how coloured objects might apparently be made to assume tints which were complementary to their actual hues—red, for example, appearing as green or greenish-blue, and green as pale red.

The phenomenon depends upon the rapid generation of negative after-images of the kind demonstrated by the familiar experiment with the red "wafer." If a red wafer lying upon a sheet of white paper is looked at steadily for about half a minute, and the gaze is then suddenly transferred to some other part of the paper, a greenish-blue ghost of the wafer will be seen. The portion of the retina upon which the red image at first falls becomes fatigued and partially insensible to red light; it is therefore unable to appreciate the red component of the white light afterwards reflected to it, and the sensation of the complementary colour consequently predominates.

The new experiments indicate that the preliminary stare may, under certain conditions, be an exceedingly brief one. In a paper published three years ago (*Proc. Roy. Soc.*, vol. lvi. p. 132) I called attention to an observation indicating that a short period of darkness imparts to the retinal nerves a degree of sensitiveness, which is far above the normal average in the light, and which quickly passes away again under the influence of illumination. This peculiar sensitiveness is in fact both acquired and lost in a small fraction of a second, and is therefore very favourable for the rapid production of negative after-images.

Let two small screens—one black and the other white—be held together in one hand, and arranged so that there may be a triangular gap between them. Let the black screen first cover the paper upon which the wafer is lying; this will darken a portion of the retina, and render it sensitive. Then let the screens be quickly moved sideways, so that the wafer may for a moment be exposed to view through the gap, the movement being stopped as soon as the paper is covered by the white screen. A bright but evanescent greenish-blue ghost will succeed the red impression. But the curious thing is that if the illumination is strong, and the screens are moved at the proper speed, no trace of red will be seen at all; it will appear exactly as if the actual colour of the wafer were greenish-blue. The action of light after a short period of darkness seems to have the power of appreciably diminishing the sensibility of the retinal nerve-fibres in a space of time so short, that if the light be coloured its colour is not consciously perceived. I am informed that analogous phenomena have been observed in other branches of physiology; a well-defined reaction sometimes occurs when no direct evidence can be detected of the existence of the excitation to which the reaction must have been due.



By the use of a rotating disc having a black and white[1] surface and an open sector, as in the annexed figure, the effect can be shown continuously. The disc is made to turn some six or eight times in a second, while its front surface is strongly illuminated either by bright diffused daylight or by a powerful lamp. An incandescent lamp of 32 candle-power at a distance of six inches gives excellent results; it should be placed opposite the disc, and should be provided with a small tin reflector to protect the eyes from the glare. A red card placed behind the disc is made to appear green, a green card pink, and a blue one yellow, while a black patch painted upon a white ground appears whiter than the ground itself. At the conversazione of the Royal Society on May 19, I exhibited some designs which had been prepared for the purpose of demonstrating the phenomenon in a striking manner. Among them was a picture of a lady with indigo-blue hair, an emerald-green face, and a scarlet gown, who was represented as admiring a violet sunflower with purple leaves. Seen through the disc the lady's tresses appeared flaxen, her complexion a delicate pink, and her dress a light peacock-blue, while the petals of the sunflower became yellow and its leaves green. Other designs showed equally remarkable transformations of colour.

SHELFORD BIDWELL.

[1] A pale brownish-grey tint is better than pure white.