

more or less divergent, these portions are not sufficiently refracted to unite upon the centre, but reach the surrounding parts of the retina in the order of their refrangibility, red external, blue internal, yellow intermediate.

The cause of the colour phenomena, therefore, is diminished refracting power of some of the ocular media, and in this relation it is natural to think first of the crystalline lens, on account both of the complexity of its structure and of the well-known fact that it is liable not only to lose its transparency and elasticity in old age, but also to acquire a yellowish or brownish tint. It has been assumed, but, so far as I know, without evidence, that such colour changes are of almost normal occurrence in old age; and, some eighty years ago, an ingenious quack traded upon the suggestion that they were not only normal, but also useful, and placed upon the market, at a high price, spectacle lenses professedly made of clear amber and supposed to be highly advantageous to old people. More recently Dr. Liebreich amused the Royal Institution by a lecture in which he maintained that the peculiarities of Turner's later colouring were due to the gradually deepening yellow of his crystalline lenses. I have, of course, removed many yellow or brown lenses in cases of senile cataract; but I know of no evidence that the healthy lens of an accurately seeing eye changes its colour with age, and I believe that my own perception of all shades of colour remains entirely accurate, and affords satisfactory evidence of complete lenticular colourlessness and transparency.

The vitreous body does not, I think, either display any change of colour as an incident of advancing life, or take any active part in refraction, and my observations lead me, at least in my own case, to dismiss the corneæ from consideration. My spectrum rings are too constant, and too uniform in size, constitution, and colour, to be due to a structure liable to be affected by atmospheric, secretory, or compressive changes. I have kept my eyes open as long as possible, have compressed them with and through my eyelids, have rubbed the eyelids themselves, but, whatever I do, the colour rings remain unaltered. In a word, I have fallen back upon the lenses themselves as the immediate causes of the phenomena, and the question that next arises is whether these phenomena justify any apprehension of diminution or loss of lenticular transparency—in other words, of cataract. I think not. I have carefully examined my own eyes by looking at various sources of light, and at white clouds, through minute slits or minute circular openings in metal discs, and I do not discover any traces of striæ of opacity. The usual shadows are cast upon the retina by minute cells or particles in the ocular media—the shadows so minutely described by the late Dr. Jago in his book on "Entoptics"—but beyond these there is nothing.

I have come to regard the colour rings mainly as an accidental result of unimportant lenticular conditions, the effects of which are intensified by the use of electric light, and which may be dismissed from consideration so far as the quality or the maintenance of vision is concerned. They appear only when the gaze is directed towards the luminosity furnishing them; and they may, I think, be wholly disregarded. I shall be happy if my experience can afford relief from anxiety to any contemporary or other person to whom such rings may have caused uneasiness. R. BRUDENELL CARTER.

An Optical Phenomenon.

THE phenomenon described by Capt. C. J. P. Cave (NATURE, October 18, p. 126) is one of the many instances which support Hering's "Theory of the Processes in Living Substance." According to this theory

every kind of living substance is subject to two reciprocal forms of change, the one constructive or "assimilative," the other destructive or "dissimilative." (These terms are nearly synonymous with Gaskell's more characteristic, though not quite classical terms, "anabolic" and "katabolic.") Every effective stimulus causes one or other of these changes, and at any given instant the living substance is in a state of unstable balance between the two, like a flying animal or machine between the force of gravity and the lifting force. *On the cessation or diminution of any stimulus, the living substance tends to return towards the state of balance from which that stimulus changed it.*

The theory applies especially to the very unstable substances of muscle, nerve, and sense-organ. Now, if an effective stimulus be removed from a sense-organ, the return of the sensitive substance towards the former state of balance, being a reciprocal change, produces a reciprocal sensation if such be possible, as when the removal of a hot body from the skin causes a sensation of cold, or the removal of a coloured object from the field of vision causes an after-image of the complementary colour. So the cessation of the stimulus of a moving image on the field of vision causes reciprocal changes (of complex character, no doubt) in the nerve-tissues concerned, which are interpreted at headquarters as reciprocal motion.

An English translation (by Miss F. A. Welby) of Hering's paper describing this most interesting and important theory may be found in *Brain*, 1897, p. 232. F. J. ALLEN.

Cambridge, October 20.

Native Grasses of Australia.

I REGRET that in my "Age of Mammals," published in 1910, the statement is erroneously made that native grasses are absent from Australia. I am unable to find my authority for this statement, and I regret that it has been quoted in a recent text-book of geology by my friend, Prof. H. F. Cleland.

Prof. E. W. Berry, botanist at Johns Hopkins University, informs me as follows:—"There are certainly plenty of native grasses in Australia; in fact, there is quite a large number of genera confined to that country or to Australia and New Zealand, which is unusual for this group, since grasses, as shown by their present distribution, are an old stock, and enjoyed a nearly world-wide radiation probably as early as the Upper Cretaceous. Possibly the multiplication of turf-forming species was not accomplished until the progressive desiccation of the climate in certain areas at a later time, and I think that this distinction has been more or less overlooked. Some of the genera of grasses confined to Australia are:—Neurachne, Plagiostetum, Xerochloa, Potamophila, Microlæna, Tetrarhena, Amphipogon, Echinopogon, Dichelachne, Diplopogon, Pentapogon, etc."

HENRY FAIRFIELD OSBORN.

The American Museum of Natural History,
New York, September 27.

Vegetable Pathology and the Vicious Circle.

IN animal pathology disease is frequently complicated by reactions which aggravate the primary morbid process, and so establish what is known as a "vicious circle." This process *vires acquirit eundo*, and may lead to the perpetuation of disease, to the destruction of an organ, or even to the termination of life. I should be glad to know whether any examples of such "vicious circles" are met with in vegetable pathology.

JAMIESON B. HURRY.

Westfield, Reading, October 26.