(*Camelina sativa*) as a single example of agricultural produce. "The cultivation of this plant for the seed would repay the farmer; an abundance of chaff would be produced which would be of infinite service for horses or for manure. In a grazing country like England, where vast sums are annually expended for foreign oil-cake, the Gold of Pleasure will soon be found an excellent substitute under manufacture, and, consequently, a grower should find a good remuneration in cultivating the seed. The oil-cake has been found highly nutritious in the fattening of sheep and oxen, as it contains a great portion of mucilage and nitrogenous matter, which combined are found very beneficial in developing fat and lean." The prospects of making this a most important agricultural plant are, we think, too brightly drawn, considering that it has not escaped the notice of English agriculturists. Nevertheless, a few words of this kind on different products might help to promote experiments on their culture and utility. The writer's aim throughout seems to be a general utilisation of vegetable productions, and he very ingeniously finds a variety of application for those of the Southern States. We do not hesitate to say that a few books of this description on the economic products of different parts of the globe, would make us much better acquainted with the true value of the vegetable kingdom than we are at present.

JOHN R. JACKSON

Adventures of a Young Naturalist. By Lucien Biart. Edited and adapted by Parker Gillmore. (London: S. Low, Son, and Marston, 1870.)

THIS is a narrative of travel in Mexico, intended especially for young people interested in Natural History. The party consists of a young lad the hero, his father, a Swiss naturalist who does all the moralising, a dog, and one of those half-bred Indians who know everything and can do everything, who are such a bore in most books of Western travel. Though written in a somewhat pedantic style, we have no doubt it will find many admirers among our adventure-loving young readers, the country described being one of unsurpassed beauty and interest. For our own part, we should decidedly object to being cross-examined in the following manner before being allowed to eat our breakfast. "Do you know the family of the animal we are going to have for breakfast?" asked Sumichrast. "Yes; it is a Rodent." "Well done; but how did you recognise it to be so?" "By the absence of canine teeth in its jaws, its large incisors, and its hind-legs being longer than its fore-legs." Especially if the lesson were given in such a confused style as this:—"The bird belongs to the family of Climbers, that is to say, to that order which have two toes in front of their claws and two behind, like your great friends the parrots." Still the young naturalist will find in the book much that is interesting and amusing; and the numerous illustrations and gorgeous binding will make it an acceptable present during the Christmas season.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Contribution to the Dioptrics of Vision

IN the course of some experiments in reference to vision under water, I have ascertained some facts which I do not remember to have seen mentioned by writers on optics, and which may perhaps interest your readers.

Every swimmer knows that, however clear the water may be, and however distinctly he may see from the bank the smallest particle of gravel or weed, the moment he plunges beneath the water all becomes obscure, and he can see the outline of nothing at the bottom or suspended in the water distinctly, but only blurred patches of various colours. In my first endeavours to find a remedy for this imperfect vision, I found two ways of restoring perfect sight. The one was to surround the eye with a watertight box, with a piece of plain glass in front. By this means, the eye being in the same condition as to receiving the rays of light through an aërial medium as when we are on land, perfect vision is retained beneath the water. The other was, allowing the eye to remain exposed to the water, to look through a glass lens whose proper focal distance in the air, I found, after numerous trials, to be half an inch. The first method is attended by the disadvantages that the glass soon becomes dim from the condensation of vapour, and it is difficult to make it fit so accurately as to exclude the water; the second is more convenient, as any optician can construct a pair of spectacles suitable for the water, and fitted with lenses of the required focal distance.

Fishes, cetaceous animals, and seals, see perfectly below the water, while man's vision, unassisted, is of the most imperfect character. The eyes of these marine animals differ from those of terrestrial vertebrates chiefly in this: the latter have a very convex cornea, with a large chamber containing aqueous humour and a double convex lens behind; whereas the former have a flat cornea, hardly any aqueous humour, and a spherical lens, lying, at least in fishes, close behind the transparent membrane which is their substitute for a cornea.

Now, as an optical instrument, the eye of terrestrial vertebrates—and let us take that of man for an illustration—consists of two lenses, one placed behind the other. The anterior lens is formed by the aqueous humour, its actual figure being a meniscus, one surface being convex the other concave, but both surfaces uniting if prolonged. According to Donders, the anterior radius of curvature, formed by the cornea, is 8 mm., the posterior, formed by the front of the crystalline, being 10 mm. The posterior lens is the crystalline, a double convex lens, its posterior surface, according to the same authority, having a radius of 6 mm. only. The combination of meniscus and double convex lens is known to possess peculiar optical advantages. The vitreous humour cannot act as a convex lens, its form being that of the concavo-convex lens, whose property is to cause divergence of rays of light; but, as it lies in contact with the retina, it cannot even produce this effect. It acts, together with the aqueous humour, as a watery medium for the suspension of the crystalline.

What happens when the human eye is immersed in water? A transparent lens-shaped body will refract the light in converging rays, if it is much denser than the surrounding medium through which the rays of light reach it. A simple experiment will prove this. Take two watch-glasses with their concavities facing one another; fill the space between them with water; this will form in air, than which it is so much denser, a lens of power proportioned to the convexity, but in water it will not refract the light at all, being of the same density as the light-conducting medium. The aqueous humour of the eye being much denser than the air, acts as a lens in the atmosphere, but being of the same density as water, when the light is transmitted to it through water in contact with the eye, we at once lose the use of our anterior lens, and can see nothing distinctly; because the crystalline, which alone now acts as a lens, throws its focus, as we shall presently see, beyond the retina.

How, then, are we to recover perfect vision under water? Obviously, by supplying the loss of our anterior lens by another lens of equal power. The focal distance in the air of a water lens of the meniscus shape and the dimensions given above may be calculated; it is, in fact, two inches or thereabouts; but, as we have seen, it $= 0$ in water. But, as the refractive power of a lens diminishes in proportion as that of the medium through which it receives rays of light increases, we find that a glass lens when immersed in water has only one-fourth of the refractive power it possesses in air. So, in order to supply the loss of our anterior lens, we find we must use a glass lens of about half an inch focus, which, in water, has a focus of about two inches. I need scarcely say, that in the case of a double convex lens of dissimilar curves it makes a great difference as regards the refractive power whether the lens be wholly immersed in water or one or other of the convex surfaces only. But I need not dwell on this subject at present.

But it is a clumsy method to supply the loss of a lens of two inches focus by one of the high refracting power of half an inch. Besides, a glass lens of this power is so small that the lateral field of vision is of necessity very limited, and it has a further disadvantage that we can see nothing with it in the air. I therefore sought for a lens that should be free from these defects.

As the ocular lens whose place had to be supplied is formed