mottled with gold. The surface of the mirror is raised in low ridges, which radiate outwards from the centre in waving lines, like the sun's rays on the Japanese flag. After a few minutes' exposure to air or water a film of metallic green and blue invades the silver. But the tapetum does not line the whole of the back of the eye. It is bounded by a sharp irregular line which crosses the wall of the globe horizontally, about ·1 mm. below the level of its equator. The lower portion of the retina, a little less than a quarter sphere, is backed, as it is everywhere in the human eye, by dense black pigment. Colonel Herschel observes that a man's eye does not gleam.

In a superbly illustrated monograph published in the Philosophical Transactions of the Royal Society Dr. Lindsay Johnson pictured the eyes of a great number of the animals in the Zoological Gardens as he saw them with an ophthalmoscope. With the exception of monkeys, the elephant, rhinoceros, and hyrax, all terrestrial mammals are provided with a tapetum. The exceptions are significant. In monkeys, as in ourselves, the retina shows a "yellow spot." They trust to direct vision with its minute discrimination of detail. They move their eyes with great rapidity towards the objects which they wish to examine. Such rapid movement is incompatible with extreme sensitiveness to the movements of external objects. A cat does not move its eyes. It moves its head. Of hyrax I have nothing to say, but the elephant and the rhinoceros stand alone amongst Herbivora. They alone are indifferent to the movements of lurking enemies—great cats and snakes. They do not need to sacrifice visual precision, as it must be sacrificed in animals in which the retina is backed by a mirror, in favour of a capacity of detecting movement.

I have examined the eyes of a considerable number of animals, and find that the disposition of the tapetum, considered in its relation to the habits of the animal, is in all cases in harmony with the view as to its purpose which I have here expressed. I am also prepared to give an explanation of the optics of its relation to the retina, but for this or for special illustrations I must not trespass upon your space.

ALEX HILL.

COLONEL HERSCHEL's letter in NATURE of January 18, followed by that of Mr. Hunt, have no doubt interested others besides myself. I do not think that there is any reason to suppose that any animal's eyes are "autophanous," however general the belief to the contrary may be among those not given to accurate observation. I can add to the list of the apparently autophanous the springhaas in South Africa and the common English mouse. I generally encourage a few of the latter, and at the present time three have taken up their abode with me in Victoria Street. There is a regulator clock standing $1\frac{5}{8}$ inches away from the wall, and about 6 feet high. I put a little food on the top of the clock, and sometimes behind the clock not quite so high, and in other awkward places. The mice jump on to the skirting board, and there spread themselves out sideways so as to stretch the $1\frac{5}{8}$ inches, and then proceed to go up at an angle of about 40°, climbing, so to speak, a staircase that is not there, and then when this brings them to the side of the clock they turn over in a nimble way with a jump, not always successfully, and negotiate the next flight, and so zigzag to the goal. I often watch these quite close, holding a metallic filament electric light with shade, so that they are fully illuminated and I am in shade. So long as I am quiet or move slowly, doing nothing spasmodically, they take no notice. I have even prodded and moved the food they were eating with the slide of a long rule, which seemed to perplex rather than frighten them. They do not seem to hear loud noises or singing provided they do not contain S, K, or other sudden sounds, even though I am not a yard away. A few days ago while writing I heard one at work on some bread about 4 feet from the ground, when, to see him better without getting up, I focussed the filaments of the electric lamp upon him with a large reading-glass. The mouse did not seem in the least frightened, but stared at the lens a short time, and then I saw his eyes shining with a pale ruby, or rather spinel, colour, and was reminded of Colonel Herschel's letter.

The same action which makes animals' eyes appear "autophanous" is seen in far greater perfection in that invaluable little instrument called the reflex light, now used in large numbers to protect the bicyclist from being run down by a motor-car at night. The bicyclist's lamp, of course, is useless, as its light in the road is outshone by that of the motor-lamps, and the lamp itself is generally not directly visible from behind. The bicycle and rider, too, are often by no means conspicuous objects, and the danger of being run down is a real one. To meet this, the reflex light has been invented. It may be considered to be a glorified cat's eye. All that is visible from the outside is a ruby bull's-eye lens, but inside, in the principal focus of this lens, there is placed a concave silvered reflector of half the focal length, *i.e.* the bull's-eye is at its centre of curvature. Any strong light shining upon the bull's eye is therefore brought to a focus on the surface of the mirror, and whether the light is directly in front of the lens, or on one side even to a surprising degree, the focussed light falls normally upon a portion of the reflector, which sends it back to the lens, and so in a parallel beam in the direction from which it came. The driver of the car and his lamps subtend so small an angle at a distance of, say, 200 yards, or very much less, that the reflected light is seen by the driver like a red lamp. The committee of the Associated Automobile Clubs were so impressed with the value of this device that the technical committee of the Royal Automobile Club, of which I am a member, examined and tested the reflex light, and they issued a certificate endorsing the claims made for it. There is a feeling that every cart in the country should carry one, which, unlike ordinary lamps, would entail no trouble or running expense, and would be free from all risk of fire. This reflex light beats any cat's eye or other animal's eye, but it is not autophanous.

C. V. BOYS.

THE experiments described by Colonel Herschel in NATURE of January 18 illustrate the reflecting power of animals' eyes, and give no support to the general view that the eyes of cats and dogs "shine in the dark," that is, in the absence of any external source of luminosity. The principle of the experiments is illustrated by the Reflex Lamp commonly fixed at the back of the frame of a bicycle in rural districts. This is not really a lamp, but a bull's-eye of ruby glass about 2 inches in diameter, fixed with the convex surface directed behind the bicycle. When a carriage or motor is approaching the bicycle from behind, its lamps illuminate the bull's-eye, and the reflection is so clear that the driver knows a cyclist is in front of him long before the rider or the machine can be seen. The candle-light used in ordinary carriage lamps enables the Reflex Lamp to be visible at a distance of a hundred yards or so on a dark night. The conditions are precisely similar to those described by Colonel Herschel, the only difference being that a glass convex lens takes the place of the animals' eyes.

R. A. G.

January 27.

Glazed Frost; a Reminiscence.

MR. HARDING's letter (NATURE, January 25, p. 414) reminds me of an experience which, in view of the rarity of the phenomenon, may be of sufficient interest to place upon record in these columns, although the newspapers of the period—the sixties of last century—duly noted the occurrence. It must, I think, have been in 1866 or 1867 (date and year uncertain) that I had occasion to go from the West to the East End of London. Starting upon my journey about 10 p.m., it began to rain soon after I left the house in Bayswater, and I opened an umbrella, which, to my surprise, became stiffer and heavier every moment, and was found on examination to be so thickly glazed over with ice that it was impossible to close it. At the same time the pavements and roadway were also becoming uniformly glazed; pedestrian movement was most difficult, and all horse traffic was suspended. Although an experience of some forty-five years ago, the impression left upon my memory is still vivid—the ludicrous sight of people carrying ponderous and rigidly frozen umbrellas which they could not close, the stream of skaters down Oxford Street