

is nearly at the full, and the sky is cloudless and darkly blue. The ocean is silvered with its light, except where its bright waters are crossed by a distant breakwater. There is a soft breeze off the sea, but the temperature still remains very near the do-nothing point. It is the time for a little quiet chat, in low-toned voices that suit the night.

about the lights far out at sea in passing ships, of idle speculation of whence they come and whither they are bound; of what may be passing in busy, turbulent, seething Europe; of the great ocean before us with its thousands of miles of trackless solitude. And then speech ceases altogether and the time of dreams comes.

H. W.



A FEW WORDS ABOUT COLOUR-BLINDNESS.



N the year 1790, Mr. John Dalton, the principal of a well-known school at Kendal, then about twenty-seven years of age, an acute and vigorous observer and thinker, walked into his garden and gathered a bunch of geraniums and roses, with which he set off into the town. On his way, a party of young ladies complimented him on the beauty and brilliancy of his flowers, but were rather facetious as to their arrangement.

"You have got," they said, "all the reds and greens so curiously mixed; and you a botanist, too."

"For my part," said Mr. Dalton, "the whole bunch appears to be pretty much of one colour; though some of the leaves which you call *light green* seem to me rather more like white; while the dark ones would match with a stick of red sealing-wax."

Mr. Dalton was suffering from Colour-blindness, then an unknown word, but now beginning to be talked about as something more than a curious and rare infirmity of vision. It is hard to understand the possibility of a boy's climbing into a cherry-tree laden with ripe fruit, and seeing no difference between the colour of the cherries and the green leaves that hide them. Yet Dalton not only did this, but when grown to manhood actually walked down "The High" at Oxford in the red gown of a D.C.L., totally unconscious of his flaming appearance in the eyes of all who passed him.

Recent statistics prove that nearly sixteen in every thousand sighted persons may actually do what Dalton did, as a boy in the cherry-orchard, or as an illustrious doctor at Oxford. Taking the population of Great Britain as about 30,000,000, this will give about 480,000 who are colour-blind; any one of whom may innocently put a patch of crimson on a garment of sable, or choose a plume of *red* ostrich feathers for the hearse of his departed spouse. If a gallant captain in "the Queen's Navee," he may select scarlet nomenclatures to match his uniform of blue; if a clerk in the City, he may unconsciously write half his letter in red ink and the rest in black; if an artist, clothe his green trees in glowing red, and his azure sky in pink; or if a cook, compound a salad without detecting a shade of difference between ruddy lobster and cucumber of green.

Such mischances may seem trivial, but when one remembers that a similar infirmity may befall the engine-driver of the "Flying Dutchman," or the pilot of a "homeward-bound" up Channel, the matter is a very different one. "Red" (*danger*), says the signal—"Green" (*safety*), says the driver. "Starboard," says the red light—"Aye, aye, *larboard* it is," says the man at the helm, with a thousand souls on board! One pilot in every twenty-five may be colour-blind.

All such contingencies, however, were undreamed of in the days of Dalton, although before then it had been reported to the Royal Society that one Harris, of Maryport, Cumberland, having picked up a scarlet stocking, could see no reason for calling it red, any more than calling unripe cherries green. But as years went by, Mr. J. Dalton, by this time famous as a scientific chemist, thinking more deeply of the tricks his eyes played him, laid before the Manchester Philosophical Society (1794) a paper on extraordinary facts relating to vision of colours, in which he wondered how such amazing differences of vision as his own and Harris's could have so long existed without notice. Whatever the Manchester philosophers thought of this, after a few years the subject happily fell under the ken of Sir J. Herschel. The problem of semi-blindness at once attracted him. He sent to Mr. Dalton a variety of different-coloured skeins of silk, not naming any, but asking him to match such as seemed alike, and note all points of dissimilarity. This was exactly what Dalton wanted, and on the data thus furnished Herschel founded that theory now generally accepted, of which we will try to give a brief summary.

Dalton, looking at the solar spectrum, saw in it only two varieties of colour, yellow and blue, as he called them; red seeming to him only as a shade, or defect of light—a strange peculiarity which Herschel regarded not as a question of defective vision, but of pure sensation.

People possessed of normal sight have, it seems, "three" primary sensations as to colour, whereas the colour-blind have but "two." To these "three," red, yellow, and blue, we sighted people refer all colours; the others being but various mixtures of the three primary tints. To the eyes of the colour-blind all the other tints seem referable to but "two" primaries, "which," says Herschel to Dalton, "I shall call A and B; the equilibrium of which two produce your white,

their negation your black, and their mixture in various proportions all your compound tints. What sort of sensation," he adds, "A and B afford to the colour-blind, we can no more tell than they can tell what our α , β , γ (red, yellow, blue) afford to us."

To this strangely limited form of vision—admitting only two tints, blue and yellow—Herschel gave the apt name of "dichromic;" and his theory, having been amply verified by succeeding investigation, is now generally (with some slight modification) accepted. Whatever other peculiarities, therefore, the vision of the colour-blind may possess, its compass must be of the most limited kind. If yellow and blue be to them the only visible tints, all the wondrous and beautiful combinations of orange, green, red, and violet must be unknown; and the charm that lies hidden under such words as the rainbow, spring-tide, dawn, and sunset, and speaks with living power to the inner heart of the rest of the world, to the colour-blind carries but a broken message. The beauty of earth, sea, and sky, as it appeals to us in all the full mystery of blended, contrasted, and harmonised colour, is simply beyond their conception. A partially deaf man may, indeed, gather somewhat from the broad roll of the deep, full-toned choir; a faint echo of its mighty volume of sound as a whole; but of its softer and more delicate *nuances*, its tiny waves of melody, its lights and shadows, the cadence, the dying fall, or the gradual resurrection into the stormy rapture of a full diapason, he can know nothing. Scarcely less hapless, as regards the glowing world of colour, is the condition of the 480,000 colour-blind, to most of whom the countless images of grace and beauty that speak to the world from the flowery mead, the dying glory of autumn, the expanse of azure sea, the flush of dawn along the mountain-tops, or of ruddy sunset against the peaks of eternal snow, are simply accents in an unknown tongue.*

But the whole question of colour-blindness opens up to points of wider importance. First, colour-blindness, it would seem, is not to be regarded as curable, or indeed as itself a disease, though possibly a symptom of diseased retina. Dalton's eyes, after his death, were carefully examined (*one* actually dissected) for the purpose of ascertaining the cause of "his anomalous vision;" his idea being that such faulty sight was owing to the fact that one of the humours of his eyes was a coloured medium, probably some modification of blue. But the *post-mortem* proved beyond a doubt the fallacy of this theory, the vitreous humours being found absolutely free from colour.

But though not a positive disease, colour-blindness would seem to be widely inherited—four brothers in one family being thus afflicted: of whom, oddly enough, three were clever wood-engravers, and the fourth, still more oddly, a painter in water-colours, which, however, he was obliged to have labelled for him in his daily work.

Statistics, too, however imperfect, clearly prove this much—that the tendency to colour-blindness may be stayed by good diet, and a healthy exercise of body, brain, and sight, as a single fact may help to show. Out of the 18,000 persons examined by the Ophthalmological Society, 5,000 were members of the Metropolitan Police, among whom colour-blindness prevailed to the extent of 4.5 per cent., while among the keen, intelligent youngsters in the playing-fields at Eton, this ratio sank to 2.5 per cent. And if the skeins of coloured silk could have been applied to the young maidens of a well-known girls' school (seven or eight hundred in number) it would have fallen still lower, probably to about 0.4 per cent.; the ratio of colour-blindness among women as compared with men being twelve times less. This wide difference between the sexes is natural enough, when one remembers the earlier development and swifter intelligence of little Mary, who learns and rejoices to dress her doll or herself in the gayest colours, while her brother Jack cares little or nothing whether his breeches are scarlet or green as long as they have good, big pockets in them.

One more point has yet to be noted among the statistics of colour-blindness: the singular fact that the three classes most liable to this anomalous vision are deaf-mutes, Jews, and Quakers. As regards the first of these, if it be true that freedom from the calamity depends largely on the perfect and healthy condition of body and brain, the low status of the deaf-mute is at once a sufficient cause. The great majority of deaf-mutes belong to a low and debased class, for whom until recent times little has been done. Scrofula, an inherited disease, is too often the cause of their special calamity, which again they bequeath by close intermarriage to their children, thus furnishing more inhabitants for the strange world into which neither sound nor colour finds true entrance.

Why the descendants of the house of David, who, as a whole, are deficient neither in power, intelligence, nor culture, should be especial victims of colour-blindness, is not so clear. But even among them close intermarriage is the rule rather than the exception, with its inevitable fruits.

One more point, and we have done. Out of 9,200 engine-drivers nearly 400 were colour-blind, *i.e.*, more or less unable to distinguish a green signal from a red one. Further and full inquiry is therefore absolutely needed. For Mr. Gladstone yet other troubles are in store. One more item is to be added to the list of School Board Examiners. An inspector in colours (Mr. Ruskin will choose his æsthetic robe of office) must be appointed; and before any man can become a policeman, an engine-driver, a pilot, a guard, a chemist, a soldier,† a weaver, or a botanist, he must undergo the ordeal of "passing" in "Holingren's" skeins of coloured wool.

B. G. JOHNS, M.A.

* "The rosy light of sunset on the Alps, which," says a colour-blind man of high repute, "threw my friends into raptures, seemed all a delusion to me."

† A soldier, or he may some day unhappily fail to distinguish between the scarlet uniform of his friends and the blue, green, or grey of the enemy.