

factures, and to the phenomena of every-day life. The subject of ventilation, for example, is very fully discussed and illustrated by experiments. There is also a beautiful experiment illustrating the intermittent action of geysers (p. 195). Perhaps the most important application of the laws of heat, however, is the steam-engine; and most of the various forms, including locomotive and marine engines, are described. Even the gas-engine is briefly referred to.

There are no less than 138 excellent diagrams distributed throughout the text, most of which have been specially prepared for the book.

*British Rainfall*, 1888. By G. J. Symons, F.R.S. (London: E. Stanford, 1889.)

THIS work is a general summary and epitome of a year's work, and contains a Report upon the progress of rainfall investigations.

The volume is divided into three parts: the first deals with the measurement of snow, experimental gauges, the Camden Square evaporation experiments, and concludes with a list of the staff of observers, showing that the staff is still on the increase, although very slowly, the chief increase being in England.

The second part treats of the rainfall and meteorology for the year, as reported from the various observing stations. One of the heaviest short-period rains recorded is that which fell on March 24 at Chepstow, Shirenewton Hall; it lasted two minutes, and in that time the ground was covered 2 inches deep with snow, the flakes being  $3\frac{3}{4}$  inches in diameter, and only  $\frac{1}{4}$  inch thick, 6 inches of this snow yielding 1 inch of water, so that, if the snow had lasted one hour, it would have reached an average depth of 5 feet.

Maps and tables indicate the monthly rainfall for the year, the greatest fall being at "The Styne" in Cumberland (175.40 inches), the least at Skegness, in Lincolnshire (17.50 inches).

Lastly, Part III. consists of general tables of the total rainfall at the 2500 places of observation.

Putting together all the above facts, we find that during the year there was much dry weather, although few droughts; there were hours and days of excessive rain, months with amounts of rain almost without precedent. Yet, on the whole, we get a result not at all remarkable, but decidedly below the average.

Rainfall observers will find in this book a collection of most interesting tables, maps, and articles upon the various branches of the work; and as the new decade begins with January 1 next year, we hope that the staff of observers will number many of our readers among them.

*Ancient Art of the Province of Chiriqui*. By W. H. Holmes. (Washington: Government Printing Office, 1888.)

THIS is an extract from the sixth Annual Report of the U.S. Bureau of Ethnology, and will be read with interest by all students of American antiquities. Chiriqui occupies a part of the Isthmus of Panama, and at the present time is inhabited chiefly by Indians and natives of mixed blood. Many ancient cemeteries have been discovered along the Pacific slope of the district, and explorers have found in them a great quantity of more or less valuable objects of art. These objects Mr. Holmes has classified, and in the present monograph he carefully describes the characteristics of typical specimens. He first deals with the graves and their human remains, then passes on to consider, in order, objects in stone, objects in metal, and objects in clay. His descriptions are concise and lucid, and their value is greatly increased by a large number of excellent illustrations. Mr. Holmes is careful to point out that there is no valid reason for assigning a very high antiquity to the works of art found in Chiriqui. The tribes by whom

the graves were made may, he thinks, have been in possession of the country, or parts of it, at the time of the conquest. Their pottery appears to indicate that they were more closely related with the ancient Costa Rican peoples than with those of continental South America; but in their burial customs, in the lack of enduring houses and temples, and in their use of gold, they were, as Mr. Holmes shows, like the ancient peoples of middle and southern New Granada.

*An Elementary Treatise on Dynamics*. By Benjamin Williamson, F.R.S., and Francis A. Tarleton, LL.D. Second Edition. (London: Longmans, Green, and Co., 1889.)

THIS work has been thoroughly revised, and a considerable alteration has been made in the order of its arrangement. The first half of the book treats of the dynamics of a particle, while the latter part deals with kinematics and kinetics of rigid bodies.

Many portions of the subject have been developed, and in some cases rewritten, especially that on generalized co-ordinates in connection with Legrange's and Hamilton's methods; the general theory of oscillations is exhibited in a new form.

The work has been arranged from the most elementary conceptions, so that anyone acquainted with the conditions of equilibrium, and with the notation of the calculus, may commence the treatise without studying any other book on the subject.

## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### On some Effects of Lightning.

DURING the thunderstorms of the 6th and 7th of June last, some twenty trees and buildings were struck within a 5-mile radius from Cranleigh. I have examined most of the trees struck, and have found a remarkable similarity in the effects, which are of two kinds: the first, by far the most common effect, is simply a score out of the bark up the trunk of the tree, out along one limb, and then by perhaps two or three smaller branches to the outer twigs; the other effect is the shattering of the tree, which occurs, as Mr. Griffith remarks in NATURE of August 15 (p. 366), when the lightning course leaves the outer surface of the tree and enters between the bark and the wood at the junction of some main branch with either the stem or with some other branch, when the shattering would probably occur from some obstruction at the junction, or from there being water in a cavity or in a collection of dead leaves in the fork.

I imagine that in general the course of the electricity is outside of the bark, following one or more lines of moisture or running water down the tree; when this conductor becomes insufficient a discharge takes place, and the stream of water is converted into steam so violently as to destroy the bark instantly along the line of strain. If the sap within be also converted into steam by communication through a knot-hole or by a flaw, the bark is blown off altogether.

If the tension be very great indeed, and especially if the air round the tree be dry, the sap may be violently exploded, and the trunk splintered and shattered as if by dynamite.

Most of the trees in this neighbourhood were struck while it was raining; but one tree, a Scotch fir, occupying a prominent position on the side of a hill, was struck before any rain fell. This tree divided out into two arms nearly in line with the stem; one arm was thrown to the ground, the other remained up for a few hours, and was then blown down by the wind, falling in the opposite direction to the first arm. At the junction there was a great deal of turpentine which was thoroughly blackened. The trunk below the arms was shivered, and the bark thrown out to a

distance very similarly to the case related by Mr. Griffith. One curious feature in the present instance was that the roots of the tree could be traced to a considerable distance by the earth above them being thrown up as over a mole barrow.

Most of the trees struck here have been oak; but there were also two poplars, four elms, a chestnut, and the fir above mentioned. It is said that beech-trees are never struck: probably the smooth close-fitting bark makes a better conductor than the rough bark of the oak.

J. P. MACLEAR.

Cranleigh, August 26.

#### Nose-Blackening as a Preventive of Snow-Blindness.

IN vol. xxxviii. of NATURE there were several interesting letters on this subject. Will you allow me to suggest a possible explanation?

For some years past I have interested myself in the choroidal circulation, and my observations have led me to believe that when light is absorbed by the choroidal pigment the blood-supply at that spot is increased. If the light is intense, this increase soon has the effect of blurring the image, and if at the same time the light is intense and the exposure to it prolonged, the sensitiveness of the retina may suffer for some time after from the same cause, *i.e.* an abnormally large blood-supply in the choroid.

In the course of the blood-vessels there is just such a connection between the retina and the skin as the nose-blackening preventive requires. My suggestion is that the blackening of the skin increases its demand for blood in some way, perhaps by its increase of temperature, and that thus a larger supply is drawn along the main branches of the ophthalmic artery, the naso-frontalis, the supra-orbitalis, and the lacrymalis, diminishing the quantity which finds its way into the small and almost independent system of the choroid. In this way nose-blackening would save the retina from being oppressed and injured in the way mentioned.

I may mention that if anyone after walking for an hour or so in the snow covers his eyes so as to exclude all external light, he will find his eyes filled with a very bright retinal light, and also if he is at all accustomed to see the blood corpuscles moving in his field of vision he will see them at such a time very distinctly and in great numbers by looking at the sky.

The theory which my observations have led me to form, that there is a very intimate connection between the retinal light and the circulation in the choroid is almost necessarily crippled by the fact that it rests largely upon subjective phenomena which are misleading, are not demonstrable, and depending on the constitution of the subject are not readily confirmed. Until, therefore, I can hear of another worker in the same field whose observations agree in the main with my own, I do not feel prepared to publish them.

HENRY BERNARD.

Jena, August.

#### A Method of Mounting Dried Plants.

AN example of a very useful and expeditious method of mounting herbarium specimens adopted here is inclosed as worthy of attention. Short strips of lead, used in packing tea, are passed through slits in the paper on each side of the part of the plant to be fastened, and the ends then bent flat out on the back of the sheet. The many advantages of using this, or some other pliable metal, in certain cases, are very obvious. Has this method been hitherto suggested?

JOHN WILSON.

University, St. Andrews.

#### COLOUR-BLINDNESS AND DEFECTIVE FAR-SIGHT AMONG THE SEAMEN OF THE MERCANTILE MARINE.

IN the House of Commons, recently, attention was called to this subject by Dr. Farquharson, who, in stating that he would take an early opportunity of discussing it next session, intimated that the efficiency of the Board of Trade regulations on this matter was open to grave suspicion. On making inquiry, we find his doubts are only too well founded. When, in the year

1852, the carrying of red and green side-lights by sailing-vessels was made compulsory, the subject of colour-blindness had not awakened the attention of practical observers. Had the fact that from 3 to 4 per cent. of the whole male population are colour-blind then been known, it is possible that some mode other than by showing red and green lights would have been devised to indicate the positions of vessels at sea at night. As there is generally but a hazy conception of what is meant by the term colour-blind, we will briefly indicate its exact significance.

When, in 1794, the distinguished chemist, Dalton, published a description of his sense of colour, the scientific world were surprised to find that there existed individuals whose perception of colour differed in a remarkable way from that of their fellow-man. To have said that an individual possessed the sense of sight was tantamount to saying that he possessed the sense of colour, the latter being considered an integral part of the former; but Dalton's report clearly showed that the two senses were separate and distinct, and that, while an individual might have a perfect appreciation of form, he might also be quite unable to perceive any distinction between two or three or more distinct and different colours. Further investigation showed that there were a few people who could discern no colour at all, every object appearing as black or white, or as shades of black and white (grey). This is total colour-blindness, and is very rare. The usual form, and that which we allude to when we speak of a colour-blind, is that in which the individual can distinguish the colours blue and yellow, but can see no difference between the colours red, green, and brown; and from the fact that one of these individuals, if given a vivid scarlet skein of wool, will select to match with it green skeins and brown skeins, it follows that he must see green and scarlet as he sees brown. Now, there being between 3 and 4 per cent.<sup>1</sup> of the whole male population afflicted with this variety, it follows that a very large section of the community are by nature disqualified for all those positions in which the correct interpretation of coloured lights is essential to safety. Clear as this fact must be, it was not until Dr. George Wilson, of Edinburgh, in the year 1855, published his admirable work, entitled "Researches on Colour-blindness," that public attention was invited to the subject. He showed with the greatest clearness how the safety of a vessel lay in the hands of men—"look-outs," officers, and pilots—who might be colour-blind, but were unconscious of this defect, or afraid to confess it; and he came to the definite conclusion, as the colour-blind were in a minority in the community, therefore, those destined to deal with signals should be selected solely from the majority whose vision was normal, and he earnestly urged upon those in authority the necessity of excluding colour-blind men from the sea profession.

One sentence was prophetic, that in which he says "the appalling yearly list of lost vessels which appears in our Wreck Returns awakens the suspicion that more than one of these fatal disasters may have resulted from the mistaken colour of a lighthouse beacon or harbour lamp, which on a strange coast, and with the accompaniments of a snow-storm or a thick fog, has been wrongly deciphered by a colour-blind pilot."<sup>2</sup> And if true of the pre-steamship days when vessels carolled along at the rate of a few miles an hour, what is to be said of the present time, when our "greyhounds" of the ocean flash along at the rate of twenty miles an hour, day and night? The regulation red and green lights of a steamer are

<sup>1</sup> Holmgren examined 32,165 men: 1019 colour-blind—3.168 per cent. Joy Jeffries examined 10,387 men: 431 colour-blind—4.149 per cent. London Committee examined 14,846 men: 617 colour-blind—4.156 per cent.

<sup>2</sup> Colour-blindness proved to be the cause of *Lumberman* and *Isaac Bell* collision: ten lives lost. Colour-blindness proved to be the cause of loss of *City of Austin*—colour of buoys was mistaken: money loss £40,000. Colour-blindness or defective sight was the cause of collision between *Carbet Castle* and *J. H. Ramier*: money loss £7500.