

Fireball of December 4, 1886

THE fireball seen at Stonyhurst College, near Blackburn, on December 4, 9h. 16m., and described in NATURE of December 9, p. 133, was observed here as follows:—

1886, December 4, 9h. 17m., meteor equal ♀. Path from $184^{\circ} + 52^{\circ}$ to $195^{\circ} + 47^{\circ}$, rather swift. At the point $180^{\circ} + 50\frac{1}{2}^{\circ}$ it left a short brilliant streak of about $\frac{1}{2}$ ", which remained visible to the eye for $1\frac{1}{2}$ minute. The meteor gave a distinct flash in the moonlight, and the streak was projected just where the maximum outburst took place.

I have made a preliminary comparison of the observations recorded at the two places, from which it appears that the fireball, when first seen at Bristol, was some 64 miles vertically over a point of the earth's surface near Farnedale, in Yorkshire. Travelling to south-west, it evolved an enduring light-streak when 49 miles high, near Thirsk, and disappeared near Otley, at an elevation of 28 miles.

These values are derived chiefly from the Bristol observation, but they are somewhat uncertain, because the meteor was at a great distance from that city, and appeared close upon the sensible horizon. According to the Stonyhurst path, the figures are less, the streak being computed at a height of 42 miles near Thirsk, and the end point of the meteor, near Otley, is indicated at only 19 miles above the earth. The observations are extremely discordant in altitude. The exact place of the streak is given by both observers, and if we adopt a mean height of 45 miles we cannot be far wrong.

The apparent radiant-point derived from the two paths is at $137^{\circ} + 59^{\circ}$. Before seeing the Stonyhurst observation, I attributed the fireball to a shower near β Ursæ Majoris, at $162^{\circ} + 58^{\circ}$, from which I saw many swift streak-leaving meteors at the end of November and beginning of December, both in 1885 and 1886. I have a strong suspicion the observed paths of the fireball are slightly in error, both as to direction and length, and that the radiant should be near β Ursæ. In this case the motion would have been from near Guisborough to Harewood at heights of about 68 and 27 miles, but this does not differ materially from the course previously assigned.

In presence of the doubts as to the fireball's exact path in the air, it is most desirable to hear of further observations, and re-investigate it.

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Bristol, December 11

THE DISPERSION OF PLANTS BY BIRDS

THE part taken by birds in the dispersion of plants is one of great interest in view of the difficulty of accounting for the appearance of certain species in remote islands, no less than in localities nearer to each other, or divided by such barriers as mountain-ranges or deep seas. This subject has, more or less, engaged the attention of botanical travellers from the time when Darwin published his classical "Journal of Researches," nearly fifty years ago, down to the publication of Mr. Hemsley's "Botany of the Challenger Expedition," Part I., which was issued as lately as last year. In the careful summary of plants probably distributed by birds, *loc. cit.* pp. 44-49, it is mentioned that seeds may be carried by birds in either of two ways. First, by seeds, especially those provided with barbs and hooks, attaching themselves to the feathers of birds, and, in the case of aquatic or burrowing birds, being embedded in mud and thus carried accidentally outside; or, secondly, by seeds swallowed by frugivorous birds being for a time lodged within, and dejected afterwards in such a state as to be capable of germination. My object now is not to treat generally of this subject, but to place on record two remarkable and striking instances where seeds carried and dispersed by birds have come immediately under my own observation. The examples which I shall here describe will, I believe, show clearly that birds are capable of acting as very effective agents in the dispersal of plants, and that the results are so apparent as to be placed beyond reasonable doubt.

In cases where seeds of a light character are provided with barbs or hooks, they are well adapted for attaching

themselves to passing objects, and are most favourably placed for dispersal by means of birds. The particular plant with barbed seeds which I describe under this category has not, I believe, been mentioned before; but it is deserving of notice, as it fully meets all the requirements incidental to this form of dispersal, and, moreover, I have had, for some years, very favourable opportunities of observing its behaviour. This plant is *Uncinia jamaicensis*, Pers. (Cyperaceæ), which grows in damp places in the mountains of Jamaica, at elevations of 5000 to 6000 feet. It is generally found overhanging small pools of stagnant water or on banks of mountain rivulets. Its slender tapering spikes, when ripe, literally bristle with long exserted rachilla, each shaped something like a shepherd's crook (hamate), but with the hooked part so closely fitting and elastic, that, if drawn along the back of the hand, it would grasp and draw out the finest hairs. Now, such places as are affected by this *Uncinia* are also the frequent resort of numerous birds that come there to drink or bathe, or to seek coolness and shade. In the case of migratory birds, and especially those that cover long distances in their flight, the high lands are generally those first touched. This is doubtless owing to the elevation at which they fly to escape surface-currents or local objects. I have often noticed birds from the north (the United States) on their way south, and again birds from the south returning to the north in early spring, frequenting the high lands of Jamaica, and resting there for a time before continuing their journey. Some such birds have been easily caught by hand, so exhausted were they with their long flight. In two instances I have found small migratory birds so completely entangled in the hooks of the *Uncinia* (*Gardener's Chronicle*, 1881, p. 780) that they were unable to extricate themselves; and, unless set at liberty at the time, would probably have died in that situation. In these instances the hooks of the *Uncinia* overstepped their proper function; for, obviously, no benefit would arise to the plant from the death of the birds, but only in the removal of the seed to another place. Larger birds, of course, would not be caught; but on the other hand, if they came within reach of the *Uncinia*, they could hardly get away without detaching a large number of the fruits and transporting them wherever they went. In the case of the *Uncinia*, there is present nearly every condition necessary to secure a very complete dispersion of its fruits. The plant, in the first place, is possessed of light portable seeds easily carried about from one locality to another; in the second place, the seeds are provided with highly specialised hooks which effectually grasp anything that comes within their reach; and lastly, the plant affects just those places which are visited by birds, and seldom fails to secure a sure and trusty carrier. It follows, as a matter of course, that *Uncinia jamaicensis* is found plentifully distributed in the track of migratory birds, and is found in similar situations in the mountains on the mainland in Central America, Venezuela, Ecuador, &c.

So much for seeds with barbs and hooks. We now come to the second class of seeds, namely, those which are swallowed by frugivorous birds and dejected in a state suitable for germination. The most striking example I know of the dispersion of such seeds, and of the results which immediately follow, are shown in connection with the pimento industry of Jamaica, which, as shown below, depends entirely for its existence on the offices of frugivorous birds. The pimento of commerce is the dried fruit of the pimento allspice, or Jamaica pepper-tree (*Pimenta vulgaris*). No other country supplies this article (although the tree itself is widely distributed both in the West Indies and on the mainland), and the value of the exports of pimento from Jamaica have reached (in 1880) a total of 100,000*l.* This is probably the largest spice industry in the world, and, to repeat what is mentioned above, it is wholly dependent upon the action