

ascending columns of air, as printed by Espy at page 167 of his *Philosophy of Storms*. The Editor has recently discovered that this reference to the Kite Club, as well as the whole of pages 161-168 of the *Philosophy*, is quoted by Espy from pp. 34-40 of an *Essay on Meteorological Observations*, by J. N. Nicollet, which essay is dated May 6, 1839. Nicollet, in these pages, fully indorses Espy's views, which, as he says, are recommended by the American Philosophical Society of Philadelphia, and it is quite possible that he has simply reproduced some one of Espy's numerous writings, however, Nicollet's pamphlet enables us to conclude with considerable confidence that the report of the Franklin Kite Club was published in or before 1838. No copy of this report has, as yet, been discovered, and it is considered exceedingly desirable that copies should, if possible, be deposited in some of the larger public libraries, where they will be preserved on account of their historical interest.

If any of the older meteorological observers possess copies of the circulars and instructions issued by Espy or the Joint Committee, during the years 1834-40, or if they possess newspapers containing reports of Espy's lectures, or any other matters of interest in the history of meteorology, the Editor will be glad to hear from them. Old manuscripts, papers, and pamphlets that have descended from one generation to another until they have become an incubus should never be destroyed or sold for waste paper until some competent librarian or historian has had an opportunity to examine them thoroughly and decide whether they are not worth purchasing and preserving permanently.

THE KITE AS USED BY ESPY.

Even before the work done by the Franklin Kite Club we note that Espy used the kite to determine the altitude of clouds as a check upon his computations, based on the dew-point of the air near the surface of the ground. His active mind had perceived that the altitude of the base of a cloud depends upon the rate of cooling of ascending moist air. The following paragraph must have been written between 1833 and 1837, and is quoted from page 75 of Espy's *Philosophy of Storms*:

I would recommend that gentlemen residing in mountainous districts, where the clouds sometimes form on the sides of the mountains, should ascertain the perpendicular heights of these clouds at their bases and see whether they are 100 yards high for every degree of Fahrenheit by which the temperature of the air is above the dew-point at the moment of their formation. * * * Since writing the above a kite was sent up into the base of a cloud and its height ascertained by the sextant and compared with the height calculated from the dew-point, allowing 100 yards for every degree by which the dew-point was below the temperature of the air, and the agreement of the two methods was within the limits of the errors of observation. In this case the base of the cloud was over 1,200 yards high. Moreover, the motions of the kite whenever a forming cloud came nearly over it proved that there was an upmoving column of air under it. I speak of cumulus clouds in the form of sugar loaves with flat bases.

In his third meteorological report, paragraph 81, written about November, 1850, and reprinted also as paragraph 81 in his fourth report, Espy says:

When the kite experiments mentioned before were performed and the kite was allowed to stay up in the air many hundred yards high in the night, by touching with the hand the reel on which the wire was wound which was attached to the kite, the *fingers became luminous*, quite brilliant, though no sensation of a shock was produced; but by touching the wire itself a very pungent shock was experienced; and one day in particular when the kite entered the base of a forming cloud the discharge of electricity down the wire, snapping to an iron conductor stuck in the ground, terminating at its upper end within an inch or two of the wire, became fearful.

In the case of the meteoric rivers (i. e., cloudbursts) the friction of the water through the air in falling might be supposed to generate electricity which rendered them luminous; but the friction of the wind on a kite eight feet square could evidently not be sufficient to account for the great quantity of electricity constantly passing down the wire; indeed the shock on touching the wire became quite sharp when the

kite was elevated a few hundred feet, even in a clear sky. *After all, it must be acknowledged that the utility of electricity is yet to be discovered, as also its mode of generation and the part it plays in storms.*

The evolution of latent caloric in the formation of cloud is undoubtedly adequate to account for all the phenomena attending storms, with but two or three exceptions noticed before, which may probably be produced by electricity—in a mode, however, not yet exactly known.

In the paragraphs preceding No. 81 there is nothing relative to kite experiments; it seems likely that Espy intended to refer to his *Philosophy of Storms* and to the kite experiments made by himself and the Franklin Kite Club in Philadelphia. In this case we see that as early as 1836 metallic wire was used instead of string in Philadelphia.

THE KITE USED IN 1822 BY FISHER.

The Editor has several times called attention to the fact that the first to apply the kite to meteorological investigations was the eminent Prof. William Wilson, of Glasgow University, who in 1749 obtained the temperatures at great elevations by means of self-registering minimum thermometers carried up by means of a kite or tandem of kites. In a recent note on this subject by our distinguished co-laborer Mr. G. J. Symons, the learned editor of the *Monthly Meteorological Magazine*, he states that the next use of the kite for determining temperatures was that made by Rev. George Fisher and Capt. Sir William Edward Parry (at the Island of Igloolik, latitude 69° 21' N., longitude 81° 42' W., during Parry's "second voyage" in 1822-23). Mr. Symons quotes the account as published by Harvey, in the *Encyclopedia Metropolitana*, article, "Meteorology," published in 1834. The experiment by Fisher is one that had long been known to the present Editor, although he was not until now aware of Harvey's reference to it. The original account quoted by Harvey is contained in a letter from Fisher addressed to Dr. Thomas Young as editor of the *Quarterly Journal of Science and Arts*, published by the Royal Institution of Great Britain (see Vol. XXI, 1826, page 348); it is followed by some notes by Dr. Young, on page 359, both of which we quote as follows:

WANTED VICARAGE, ESSEX, 23d Feb., 1826.

I have enclosed some of the observations upon the refraction at low temperatures and altitudes, made at the island of Igloolik, N. E. coast of America. And as the law of variation in the temperature of the atmosphere at different heights is connected with the theoretical investigation of the subject, I take the opportunity of mentioning an experiment made by Captain Parry and myself for determining it.

This was done by means of a paper kite, to which was attached an excellent register thermometer, in a horizontal position. Its height above the level of the frozen sea, upon which the experiment was made, was determined by two observers in the same vertical plane, taking its altitude at the same time above the distant horizon; and from thence its height was computed. The greatest height observed was 379 feet, at which height it was nearly stationary for about a quarter of an hour. It probably, however, had been more than 400 feet above the sea. After an unsuccessful attempt, the experiment was made under very favourable circumstances, the kite being sent up and caught in coming down, without the slightest shake. The indices had not altered their position in the slightest degree, and they would have indicated any variation of temperature, had it existed, to less than a quarter of a degree Fahr. The temperature at the time was -24° Fahr.

I have also enclosed Dr. Brinkley's table of refractions, adapted to temperatures as low as -50° Fahr., which he was kind enough to send me.

From, Dear Sir, yours truly.

GEO. FISHER.

Note on the above by Dr. Thomas Young on page 359:

The observations of Mr. Fisher and of Mr. Foster fully justify the remark already made in the thirteenth number of these collections, (Vol. XV, p. 128), that the refractions at low temperatures, as indicated by Dr. Young's table, which are found to be somewhat greater than those which Mr. Groombridge has observed in this country, would probably be found to be less in excess when applied to colder climates. That they would, however, have been actually so much in defect as these observations have demonstrated, could not have been foreseen without actual trial. The theory is indeed greatly illustrated by Mr. Fisher's very valuable experiment with the kite, which shows that the law of decrease of temperature must be supposed to be very differ-