or months would probably eject as much or more dust and ashes than accompanied the Krakatoa convulsion, though not to so great a height. If, however, Mr. Preece's theory of electric repulsion of the dust particles be true, then the finest of them, if highly electrified, might rise to great heights, independent of the force of ejection from the volcano.

In this connection it is well to remember that there may have been many other volcanic outbursts during the last few months, of which we have not yet heard, and perhaps never may. The whole chain of islands from Java to Alaska, including the Philippines and Japan, is full of volcanoes, and seems to be a sensitive seam in the earth's crust. A convulsion like that of Krakatoa is likely to be accompanied or followed by others along this line, the northern portion of which is only visited by otter-hunters.

Without presuming to question the theory as to the rapid transmission of Krakatoa dust by the upper currents of the atmosphere until we see the evidence on which it rests, it occurred to me that the above considerations might possibly modify or supplement it in some degree.

Referring to the remarkable results deduced by General Strachey, showing an atmospheric wave travelling three times round the globe from the Krakatoa eruption, which seems to be of even more scientific interest from a physical point of view than the transmission of the dust and ashes, and which deserves a thorough and careful re-examination when the data are in from all available barometric records, I would say that I have been kindly allowed to examine the barometric records of the Signal Office here at Washington, and I find no trace of any such disturbance following the reported Alaskan eruptions of October 6 and October 20. In connection with the record of the waves following the Krakatoa catastrophe there are some interesting points which I wish to examine more carefully before discussing them.

H. M. PAUL

Washington, January 8

REFERRING to Mr. Burder's letter in NATURE of January 10 (p. 251), is it so certain that, if there be no resisting medium in interplanetary space, the whole of the earth's atmosphere must "rotate with the earth as if it were part and parcel of it"? Take a stratum of the atmosphere at, say, forty five miles in altitude at the equator. According to the received theory, this ought of course to move with a velocity greater than that of the surface of the earth immediately below. But each successive inferior stratum moves with less velocity. And thus they must tend to retard the superior strata with which they may be assumed to be in contact. Of course the merging of stratum into stratum is gradual, but this does not affect the amount of friction and retardation.

In like manner, imagine a section of the atmosphere taken along the equator. Sections taken along successive parallels of declination north and south would tend to retard the velocity of this central layer.

These two causes combined might have a considerable effect in retarding the velocity of the upper atmosphere in equatorial regions. And it seems to me doubtful whether the upper atmosphere near the poles would be actually carried round with each terrestrial rotation. The rarity of the upper regions of the atmosphere and the lessened force of gravity would both help towards the result indicated, inasmuch as they would tend to make the atmosphere less rigid.

As I am writing, I venture to make another suggestion. Gilbert White mentions that in the summer of 1783, when, as at present, the atmosphere was filled with dust consequent on volcanic eruptions, and "a peculiar haze or smoky fog prevailed for many weeks in this island and in every part of Europe, and even beyond its limits," "all the time the heat was so intense that butchers' meat could hardly be eaten the day after it was killed, and the flies swarmed so in the lanes and hedges that they rendered the horses half frantic, and riding irksome." May not the present May-like weather be due to a like cause? Sweet violets, primroses, wallflowers, roses, and several other flowers are now blooming in my garden under the Cleveland Hills.

Had the halos round the moon seen here last and the previous night any possible connection with the dust in the atmosphere? I computed the diameter of the inner dirty white to be twice, the dirty orange one and three-quarters, and the outer green three and a quarter times the moon's apparent diameter.

JOHN HAWELL

Ingleby Greenhow Vicarage, Yorks, January 15

I THINK a few notes relating to the recent sunsets may still have an interest for some readers of NATURE. Notwithstanding the length of time these remarkable phenomena have been apparent, the sunsets of January 11 and 12 were as brilliant as regards the *second* after-glow as any that have preceded them, the final glow having lasted on the 12th till 5.55; while the sun set that evening at 4.12.

The pink halo so often seen of late could not be discerned that day though the sky was cloudless; but it has been often visible when clouds partly obscured the sun, or portions of the sky, and could then be recognised between them, separating the blue of the remoter sky from the whitish light surrounding the sun, as a ring-formed glow of a strong pink colour.

These broad pink halos have been less commented on than the splendid sunsets which have invariably succeeded them, but they have been nearly as persistent in their presence. You have had so many accounts of the succession of colours and effects of the two after-glows, that I will not allude further to them here; but as I have retained a record of many remarkable sunsets and sunrises which I observed in Wales in former days (possibly the very same mentioned by Prof. Piazzi Smyth in NATURE, December 13, 1883, p. 149, as observed by him thirty years ago), and as I carefully noted in them the time and hour of the changes in the sky down to that of the complete extinction of the after light, it may interest others than myself to compare displays of that date with those of this winter.

What is worthy of especial interest is the great difference between the periods of prolongation then and now of the illumination of the western sky, showing that the second after-glow of recent sunsets is a phenomenon distinct from and additional to those belonging to normal sunsets.

The following table exhibits the two series of observations made in 1855, 1856, 1857, and in 1883-84 respectively:—

Date	Sunset at	First after-glow or cone of pink light			Second after-glow in 1883-84, which begins as the first after-glow sets
		Appears as sunset colours are fading	Brightest at	Sets	
Nov. 11, 1856	4.13 }	4.50	4.57	5.10	5.45
" 12, " "	4.14 }	...	...	4.55	5.45
" 23, 1855	3.50	...	...	4.20	5.45
Dec. 7, " "	"	...	...	4.20	5.45
" 8, " "	"	...	...	4.20	5.45
" 10, 1883	"	...	...	...	5.45
" 11, " "	"	...	...	...	5.45
" 14, 1856	"	4.15	4.21	4.35	5.45
" 15, " "	"	...	4.20	4.30	5.45
" 18, " "	"	...	...	4.30	5.45
" 19, " "	3.50	...	...	...	5.45
" 24, 1883	3.53	...	...	...	5.45
Jan. 11, 1884	4.13	...	...	...	5.45
" 12, " "	"	...	...	...	5.45
" 15, 1857	"	...	...	...	5.45
" 16, " "	"	4.50	...	4.55	5.40
" 19, " "	"	...	...	5.0	5.55
" 26, " "	"	...	5.10	5.18	5.55
Feb. 8, " "	5	...	5.20	5.25	5.55

The colours associated with the actual sunset are quite in accord in both.

The first after-glow, or pink cone or dome of light appearing after the sunset colours have nearly faded, is also similar in both series, but its time of setting has been apparently somewhat prolonged in the recent observations.

It is the 1883-84 series alone, however, that shows the *second* after-glow, and the duration of this strange phenomenon, which I have the advantage of observing over a wide bird's-eye view in North Wiltshire, has extended on evenings when it could be well