1942 issue just reached circulation at the time of the study, so that no disturbing effect was obvious on the rest of the currency, whatever the future may show. The data gives: ½ annas—$n = 53$, $m = 2{\cdot}9125$ gm. $s^2 = 786{\cdot}88$ mgm.^{2}; annas—$n = 38$, $m = 3{\cdot}8851$ gm., $s^2 = 3934{\cdot}51$ mgm.^{2}; 2 annas—$n = 22$, $m = 5{\cdot}8023$ gm., $s = 7773{\cdot}6$ mgm.^{2} The two last fit very well into their respective lines of regression and analysis of variance. It is not likely that the debasement will cause any disturbance due to hoarding, though the rate of wear will naturally change. For, the silver alloy had already changed nearly three years ago from 11/12 to 6/12 fine; even the nickel of Geogre VI appears to differ from the older composition. Even with the pure metal used for each denomination, including the rupee, the currency would have a value of metal well below its denomination, hence the change to brass only emphasizes the most universal of all numismatic laws, the inevitable trend towards debasement in times of stress. For our purpose there is a far more serious effect visible in the samples. The minting since 1939 shows a decided increase in variance, and the occurrence of overweight specimens shows that the old legal remedy (from 1/40 for copper to 1/200 for silver) has been relaxed in practice, whatever the law at present. If this tendency was present in the coins struck during the last Great War (1914–1918), or during the depression years, it is certain to upset the linearity of variance increase, without affecting the law for mean weights. Whether the tendency towards cruder striking of the coins with regard to weight is manifested in other countries and periods before great changes of structure will also have to be studied with this example in mind.

I am grateful to the kind friends who saved me much of the labour of gathering the samples in an unusually hot summer. Special thanks are due to my geological colleague Prof. K. V. Kelkar for going out of his way to place the facilities of his laboratory at my disposal.

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[1] A. Kolmogoroff, *Math. Annalen*, **1931**, **104**, 415–458.

[2] D. D. Kosambi, *New Indian Antiquary*, **1941**, **4**, **1**, **49**.

[3] ————, *Current Science*, **1941**, **10**, **372**.

[4] R. A. Fisher, *Statistical Methods for Research Workers* [7th ed.], ex. **42**.

[5] *Ibid.*, ex. **33**.

[6] The gold sovereigns have had almost no circulation, but if just two more specimens, dated **1887**, **1897** (and used regularly for worship) are added to the sample accepted, the correlation takes the very highly significant value of ·**64**, with very highly significant deviations from regression.

AN UNUSUALLY LONG-LIVED DUST DEVIL AT POONA ON THE 27th MARCH 1942

BY

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A DUST devil was observed to persist from about 12·00 hrs. to 15·45 hrs. I.S.T. near the Central Agricultural Meteorological Observatory at Poona on the 27th March 1942. Fig. 1 shows a map of Poona and its environs; the track of the dust devil is shown by the dotted line. On the right hand side may be seen the confluence of the two rivers Mutha and Mula. 'O' is the position of the Observatory from which the dust devil was continuously under observation. The position of the dust devil at different times during its unusually long life is indicated by the letters A, B, C, D and E in Fig. 1.

At 12 noon the dust devil appeared at the point A. Its diameter was apparently about 20 to 30 ft. and its top at an elevation of about 20° to 25°. During the interval 12·00 hrs. to 14·45 hrs. the dust devil moved very slowly from the point A to the point B which is about two miles due north of the Observatory. During its passage from A to B, a distance of two miles *across* the line of sight, the dust devil might have moved slightly at intervals *along* the line

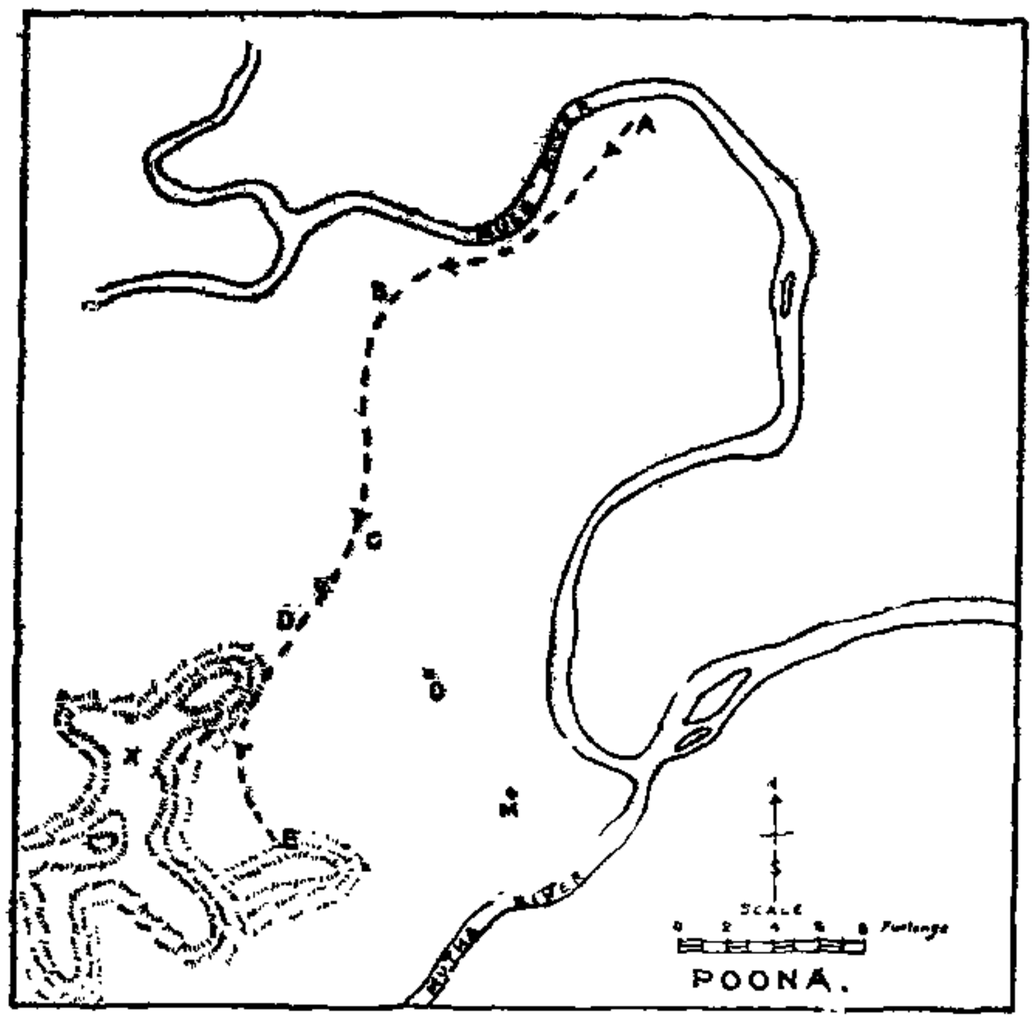

FIG. 1

of sight, but it was not possible to make any correct estimate of such movements. As it approached the position B the base of the dust devil appeared very much like a dark pillar of smoke rising out of a fire. Later, it was verified that at this point dust from a coal dump was caught up by the whirl-wind. The appearance of the dust devil during the stage AB is shown by the photographs *a*, *b*, *c*, *d*, *e* and *f* respectively taken at the time intervals indicated in Fig. 2. At about 3 p.m., while watching from the 35 ft. tower at the Observatory the dust devil was seen suddenly to gain in momentum and to move faster than before in a southerly direction. By now, the colour had changed from dark to the usual brown colour. The elevation of the top of the dust devil was now as much as about 70° above the horizon. The upper portion had also spread out, obscuring the sun for nearly 15 minutes (Fig. 2, *g*). The whirl-wind now rapidly moved in a southerly direction towards the point C. While near C, a huge galvanised iron sheet was seen to be torn off from the roof of a temporary shed. Soon after, this sheet came down and hit the ground with a loud noise. Tiles from other neighbouring sheds were also seen to fly up and fall to the ground. The whirl was now at its minimum distance from the Observatory with its direction of rotation clock-wise (Fig. 2, *h*, *i*). Then the dust whirl moved towards the hill, marked D in Fig. 1. At this place the whirl was about 40 to 50 ft. in diameter. It then split temporarily into two distinct whirls but later fused again into a single whirl with its fury slightly abated (Fig. 2, *j*, *k*, *l*).

Afterwards the whirl moved from the position D to the position E near the Fergusson College along the foot of the hill marked X in Fig. 1. The dust devil was visible till about 15·45 hrs. when it appeared to die out somewhere near the point marked E on the map.

An estimate of the height of the dust devil may be made from (*i*) the horizontal distances from the point of observations measured with the help of a big map of Poona and (*ii*) the altitude or the vertical angle of the top of the revolving column. Table I gives the approximate location, horizontal distance from the Observatory, angle subtended and the estimated height of the dust whirl in feet assuming that the "devil" was vertical. As the upper wind direction was from NNE, *i.e.*, from the "devil" towards the observer, the height calculated is likely to be an overestimate especially when the distance was small.

TABLE I

Approximate location as given in Fig. 1	Horizontal distance from the Observatory	Angle subtended	Estimated height in feet
A	24 to 30 fur.	20°	5200–5900
B	16 to 18 fur.	30°	6000–6900
C	9 furlongs	60°	9900
D	6 furlongs	70°	10600

Table II gives the temperatures observed with an Assmann Psychrometer at about 13·30 hrs. on the 27th March in the "open" at the Central Agricultural Meteorological Observatory. Lapse rates calculated from these observations are also given in the table.

Fig. 3 is a reproduction of the Dines Pressure Tube anemogram recorded at the top of the 120 ft. tower of the Meteorological Office marked M in Fig. 1. During the interval 10·00 to 16·30 hrs. the air movements were more or less of the thermal

12·30 hrs.
a

12·40 hrs.
b

12·50 hrs.
c

13·30 hrs.
d

14·00 hrs.
e

14·30 hrs.
f

14·45 hrs.
g

15·00 hrs.
h

15·20 hrs.
i

15·25 hrs.
j

15·27 hrs.
k

15·30 hrs.
l

FIG. 2

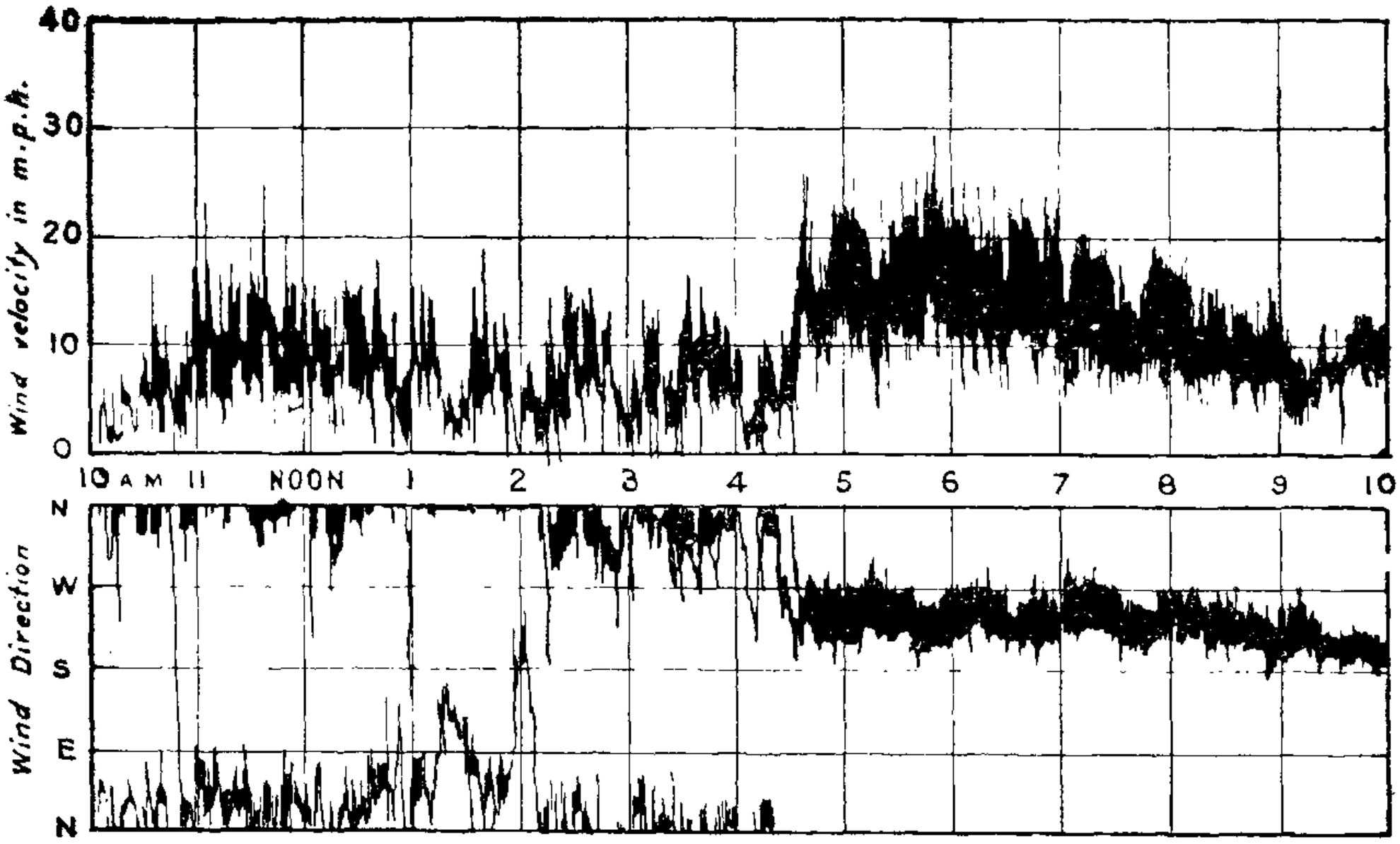

FIG. 3

TABLE II

Height in cm. above ground	Temperature in °C.	Lapse rates expressed as number of times the adiabatic lapse rate [0·987°C.(1°C. approx.) per 100 m.]
Surface	69·0	
		218000
1·0	47·2	
		13000
2·5	45·2	
		4400
7·5	43·0	
		1330
15	42·0	
		130
30	41·8	
		330
60	40·8	
		—
90	41·0	
		—
120	40·8	
		67
180	40·4	
		100
240	39·0	
		50
300	38·7	
		—
450	38·7	
		40
600	38·1	
		—
750	38·1	
		—
900	38·1	
		13
1050	37·9	

convective type with a northeast to southeast direction and comparatively low velocity (5 to 10 m.p.h.). We have already indicated in Table II the extremely high lapse rates in the air layers near the ground. The dust devil was in the convective layer throughout its life. The pilot balloon let off at the Meteorological Office in the afternoon indicated a rate of ascent of the order of 10·5 km./hr. while that indicated by the free lift of the balloon was only 9·0 km./hr. From Fig. 3 it will be seen that at 16·30 hrs. a strong sea breeze from a west-south-westerly direction set in.

The wind velocity at the Meteorological Office Tower from noon to 4 p.m., before the westerly sea breeze set in, was of the order of 5 to 10 miles per hour. The pilot balloon observation on the same afternoon indicated that the wind direction and velocity upto about 2 km. were approximately NNE and 10 miles per hour respectively. Thus although the general drift of the dust whirl was in the same direction as that of the wind upto 2 km., its velocity was only 1/10 to 1/5 of the mean wind velocity, which is surprisingly small.

A detailed study of dust devils is being made at the Central Agricultural Meteorological Observatory where conditions are favourable for observation and correlation with the other meteorological factors. A detailed report of the work done during this summer will be presented later on.