ON BOWEN'S HYPOTHESIS*

By T. R. VISVANATHAN†

Bowen (1953) examined daily rainfall at Sydney for January for the years 1859–1940, and found exceptional peaks to occur on the 12th and 22nd days of that month. He extended his investigations to other months and other stations, and concluded that there is a marked tendency for heavy falls of rain to occur on certain dates rather than on others and the pattern to be repeated year after year. He argued that if the feature is noticed in rainfall at a large number of stations over the globe the influence should be extraterrestrial. He put forward the now well-known hypothesis that on some calendar dates the Earth crosses a meteoric stream, and the meteoric dust entering the top of the atmosphere reaches the troposphere about 30 days later, to induce heavy rainfall, the influx of meteoric dust being supposed to provide the necessary condensation nuclei. He further strengthened his hypothesis by showing that such other occurrences as concentration of freezing nuclei counts, cirrus clouds, noctilucent clouds, and the dates on which snow first covered the ground at Tokyo all showed a tendency for maxima to fall on the preferred dates of singularity in rainfall.

During the last decade a number of papers have appeared, some supporting but others criticizing Bowen's hypothesis. Strangely enough the argument against Bowen's hypothesis appears to have come from Bowen himself. Adderley and Bowen (1962) showed that the heaviest falls in New Zealand occurred on certain days of the lunar month, notably about three days after the Full Moon and New Moon. Apparently heavy rainfall cannot have a preference for a calendar date as well as for a lunar day, since the event of New Moon can occur on any calendar date. Thus, there appears to be a contradiction between Bowen's meteor hypothesis and his lunar hypothesis to explain rainfall singularities. The purpose of the present paper is to reconcile the apparent contradiction.

Data

Sydney rainfall for January for the years 1861–1960 has been given by O'Mahony (1962). Of these data, only the rainfall pertaining to the period 1870–1960 was examined, as the decimal ephemeris of the Sun and the Moon (Carpenter 1962) gives the synodic decimals from 1870 onwards only.

Analysis of the Data and Discussion

The angular difference between the longitudes of the Sun and the Moon gives the phase of the Moon in degrees, and if the phase angle is divided by $3 \cdot 6$ the resultant number is the synodic decimal. The synodic decimal for each day is given in the

* Manuscript received January 4, 1965.

† Meteorological Office, New Delhi, India; present address: U.S. Weather Bureau, Washington 25 D.C., U.S.A.

ephemeris of Carpenter (1962). In the present analysis, the 100 synodic decimals are grouped into 30 class intervals to correspond nearly to 30 days of the lunar month. The rainfall amounts falling in each class were added and are shown against the class. Successive 3-lunar-day totals were then made, which gives 10-unit moving totals, and these totals are shown against the central lunar day. This procedure is set out in Table 1.

TABLE 1

ANALYTICAL PROCEDURE

Synodic Decimal Class	Corresponding Lunar Day	10-unit Moving Totals of Synodic Decimals	3-lunar-day Totals*	Shown against Lunar Day:
99, 00, 01	0 NM†	96 to 15	29, 0, 1	0 NM
02, 03, 04, 05	1	99 to 08	0, 1, 2	1
06, 07, 08	2	02 to 11	1, 2, 3	2
09, 10, 11	3	06 to 15	2, 3, 4	3
12, 13, 14, 15	4	09 to 18	3, 4, 5	4
16, 17, 18	5	12 to 21	4, 5, 6	5
19, 20, 21	6	16 to 25	5, 6, 7	6
22, 23, 24, 25	7	19 to 28	6, 7, 8	7
26, 27, 28	8	22 to 31	7, 8, 9	8
29, 30, 31	9	26 to 35	8, 9, 10	9
etc.		etc.	etc.	

* Although the class intervals of individual lunar days are unequal, 3-lunar-day moving totals have all equal class intervals of 10 units.

† NM = New Moon.

Ten-unit moving totals of rainfall for each calendar date are shown in Figure 1, where the horizontal axis represents the calendar dates and the vertical axis the lunar days. The entry 126 against the calendar date January 23 shows that a total of 12·6 in. of rain fell on those days having a calendar date January 23 and synodic decimal between 92 and 01. For the sake of clarity the amounts of rainfall less than 1·0 in. have been left out of the figure.

The rainfall distribution during the synodic month is shown in Figures 2(*a*)–2(*d*), while the total daily rainfall for days in January (1870–1960) is given in Figure 2(*e*). Figures 1 and 2 reveal the following features.

(1) The two rainfall peaks are near the 12th and 22nd, as pointed out by Bowen.

(2) The maximum rainfall on these two dates, 12th and 22nd, has occurred only when these dates happened to be near New Moon or Full Moon.

(3) From Figures 2(*a*)–2(*d*) it is seen that the peaks occurring near New Moon and Full Moon are the main feature of rainfall distribution during the synodic month.

(4) There is no support for the contention that "year after year" on specified dates heavy rainfall occurs. On the other hand it is seen that very little rain has fallen on those days when the preferred dates 12th and 22nd happened to be near the First Quarter or the Last Quarter.

Conclusion

There seems to be supporting evidence to show that Bowen's meteor hypothesis is not inconsistent with the lunar hypothesis. Heavy rainfall appears to prefer not only calendar dates but lunar days as well, and the heaviest rainfall is likely to occur when these two factors combine. The physical explanation adduced by Bowen to explain rainfall on the 12th and 22nd is plausible, though evidence presented herein goes against his statement that the rainfall is repeated "year after year" on the meteor dates. This paper seeks to revive an issue which appears to have been

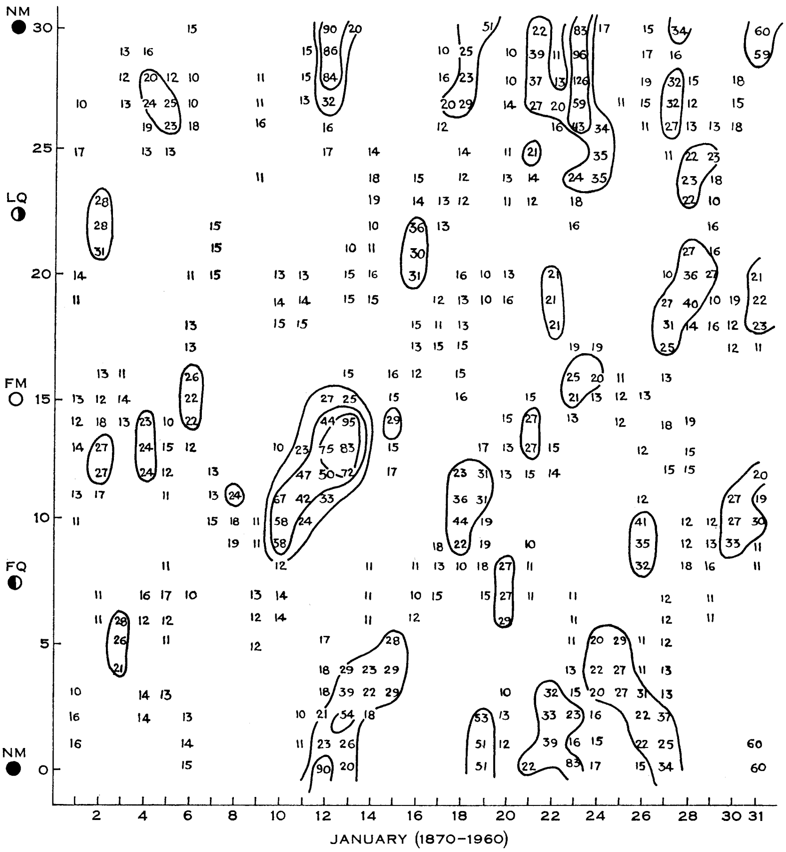

Fig. 1.—Sydney rainfall for January (1870–1960) analysed by calendar date and lunar day.

almost settled: "Is the influence of meteoric dust on heavy rainfall, or increased rainfall activity, real?" The author is not unaware of the serious difficulties into which Bowen's meteor hypothesis enters, and the arguments for and against it by several writers. Still, the evidence presented by Bowen in support of his meteor hypothesis is not such as can be satisfactorily ignored. However, caution is necessary in extending the conclusions based on the analysis of rainfall of a month or a place to other periods and other places.

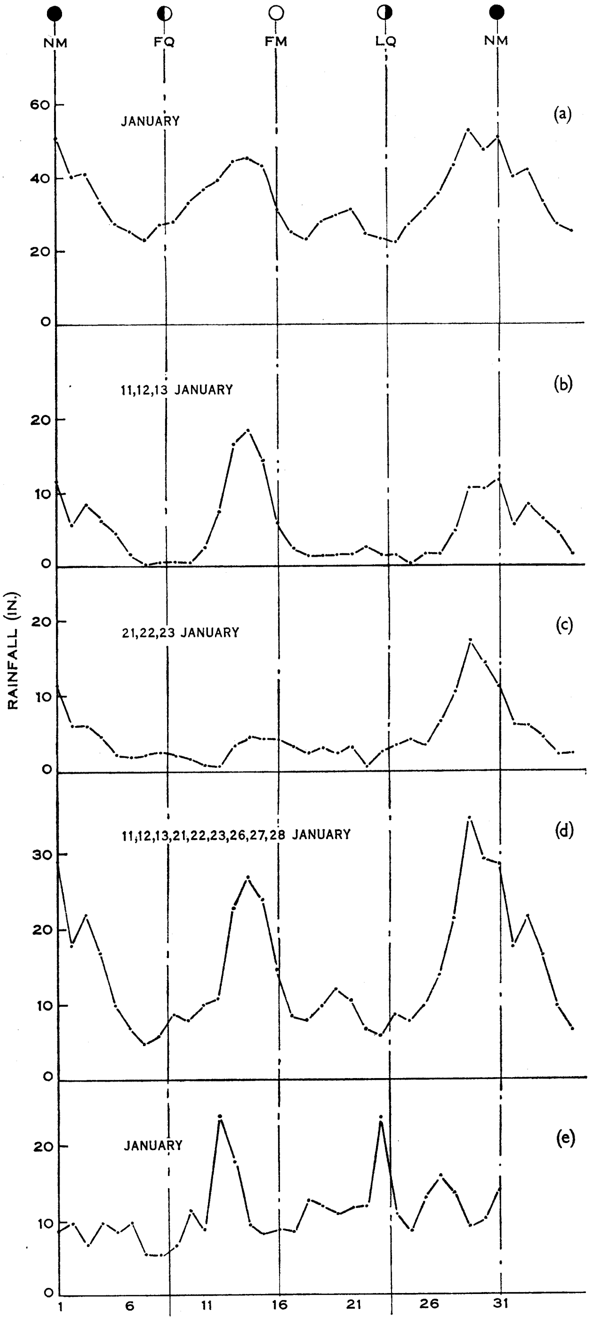

Fig. 2.—Rainfall at Sydney in January (1870–1960). (*a*) Ten-unit moving totals analysed according to lunar month; (*b*) ten-unit moving totals for the calendar dates 11, 12, and 13, analysed according to lunar month; (*c*) ten-unit moving totals for the calendar dates 21, 22, and 23, analysed according to lunar month; (*d*) ten-unit moving totals for the calendar dates 11, 12, 13, 21, 22, 23, 26, 27, and 28, analysed according to lunar month; (*e*) total daily rainfall.

References

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