From the Abinger record§ it is clear that the magnetic crochet by no means followed closely the final stages of the flare. In any case, the crochet is observed associated with only the more intense flares, and then not invariably (e.g. Mr. Newton reports‖ that the class 3+ flare of 1948 May 21 produced no crochet, in spite of favourable circumstances). Thus the magnetic crotchet is not a reliable index of flare activity.

This discussion emphasises the importance of following closely the tail of a flare which, although of low intensity, generally occupies an important proportion of the flare's life-time.

I am, Gentlemen,
Yours faithfully,
MICHAEL W. OVENDEN.

The Observatories,
Cambridge.
1949 May 23.

The Brilliant Solar Flare of 1949 *January* 23 *and the Great Magnetic Storm of January* 24–26.

GENTLEMEN,—

The great magnetic storm of 1949 Jan. 24–26 showed certain peculiarities in relation to the associated solar phenomenon observed at Kodaikanal which would be of interest to geophysicists and ionospheric workers; particularly so, because the solar flare which appears to be the immediate cause of the magnetic storm may not have been observed at other observatories.

A large spot-group, the largest since 1947 April, first became visible on January 17. It remained quiescent till January 20 after which it began to show increasing activity. On January 21 and 22 appreciable brightenings and Doppler displacements up to 0·4 A were observed over the spot region with the spectrohelioscope. Considerable brightenings around the spot-group were also recorded in spectroheliograms on these dates. On January 23 a spectroheliogram in $H\alpha$ taken at $02^h\ 30^m$ U.T. recorded a flare of unusual intensity. Unfortunately this spectroheliogram was rather underexposed and observations were not available earlier in the morning; nevertheless it was unmistakable that the flare was one of intensity which would be designated as 3+. A spectroheliogram in K taken at $02^h\ 56^m$ also showed that the flare was still of great intensity, but had perhaps weakened slightly. By $04^h\ 02^m$ observations with the spectrohelioscope as well as spectroheliograms showed that the flare had practically subsided, and only two small regions slightly brighter than the general photosphere were all that was left of the flare. From our observations it is evident that the peak intensity had already been reached by $02^h\ 30^m$; at that moment two distinct regions of great brightness were clearly visible in the eruptive area of which the central coordinates were approximately 20° N., 3° W. and 22° N., 5° E. The total area affected by the flare was approximately 500 millionths of the Sun's visible hemisphere at $02^h\ 30^m$ as obtained from the $H\alpha$ spectroheliogram and about 600 millionths at $02^h\ 56^m$ as measured on the K plate.

§ *Ibid.*, p. 75.
‖ *The Observatory*, **69**, 40, February 1949.

As was to be expected, synchronous radio fade-outs were associated with the great flare; on January 23 a complete fade-out occurred in all short-wave communication services of the All-India Radio from $03^h\ 00^m$ to $04^h\ 00^m$. It would have been interesting to know whether a burst of solar noise was also associated with the flare; but work on solar noise has not yet been begun in India.

Since the flare occurred in the most favourable region of the disk, namely in the close vicinity of the central meridian, geomagnetic disturbances were to be expected; and in fact, a magnetic storm of great intensity commenced about 40 hours later. According to Kodaikanal magnetograms the storm was clearly of the "Sudden Commencement" type with an abrupt beginning at $18^h\ 28^m$ U.T. on January 24. The initial impulse of the SC was great and unfortunately the maximum amplitude, which immediately followed the SC, was lost in the record of the horizontal force, but the later parts of the disturbance of H as well as the complete fluctuations of V and D were satisfactorily recorded. An extrapolation, which is supported by the H magnetogram of Alibagh, gives $\Delta H = 530\ \gamma$ approximately. The variations in the other two elements as derived from Kodaikanal magnetograms are $\Delta V = 72\ \gamma$ and $D = 4'$ W. The storm continued until $18^h\ 06^m$ on January 26.

On our magnetograms there was a simultaneous increase in both H and V at the commencement of the storm. Also, contrary to expectation from current theories, our magnetograms showed a simultaneous increase in both H and V during the "positive phase" of the storm, while during the "negative phase" a simultaneous decrease in both elements was recorded. But the most surprising feature of the magnetic traces of the period Jan. 23—26 is that there is no indication of a crochet synchronous with the great flare in spite of the fact that almost all the conditions were distinctly favourable for its occurrence. One might however suppose that the flare occurred too early in the morning and therefore the time was not quite favourable for the production of a geomagnetic crochet; but against this supposition we may note that on two other occasions, on February 10 at $02^h\ 34^m$ and on February 11 at $02^h\ 00^m$, our magnetograms recorded crochets synchronously with flares and radio fade-outs, and that in spite of the fact that the flares concerned were of minor importance compared with the one of January 23.

Another peculiarity of the magnetic storm of January 24—26 is of interest: it commenced about 40 hours after the flare, thus giving a velocity of 1040 km/sec for the associated corpuscles. The storm was unquestionably one of great intensity and according to the statistical conclusions of Maunder and Newton one would have expected a much shorter time lag, namely between 21 and 26 hours, between the flare and the storm. The actual time lag of 40 hours places the storm rather in the category of the smaller storms for which there seems to be a grouping of T_e values around 50 hours.

We are, Gentlemen,
Yours faithfully,
A. K. Das,
K. S. Raja Rao.

Kodaikanal Observatory.
1949 April.