minutes, but only very faintly in two or three minutes. I have tried samples of salt from several localities with the same results. WILLIAM ACKROYD.

Tables of Four-figure Logarithms.

I AM much interested by the short letter, contributed by Prof. Perry to NATURE of July 2 (p. 199), on the subject of four-figure logarithms, especially as I have myself offered a solution of the difficulty which Mr. Harrison has essayed to remedy. If, instead of using Bottomley's differences for the upper part of the tables, viz. from 1000 to 1799, we resort to the usual tabular differences found in any ordinary logarithmic tables, such as Chambers's, we get an even greater accuracy than does Mr. Harrison. The tables are naturally weakest when we have a "9" for the fourth figure of the number the logarithm of which is required. Taking this as a test, between 1000 and 1799 the accuracy of the three methods may be expressed thus:—

	Per cent.
Bottomley's differences	37·5
Ditto, Harrison's extension	58·5
Ordinary tabular differences	76

Tabular differences would be required corresponding to logarithmic differences of 43 to 24 inclusive, *i.e.* twenty small columns of differences. It may be objected that it would be unwieldy in use to change from one method of procedure to another, but I think it will be found, also, that Mr. Harrison's tables are not so easy to use as the unmodified ones. The tabular differences might, indeed, be printed down the side of Bottomley's table without disturbing the usual differences, and only be used when the best possible accuracy is desired.

One of the best solutions of the difficulty has been suggested to me by Prof. Perry himself, viz. divide the number, less than 2000, the logarithm of which is wanted, by 2, and add together the logarithms of quotient and divisor. The approximation to the true logarithm of the number is very good.

I cannot agree that chemists, in any case, should use four-figure logarithms, seeing that they habitually return four figures as significant. I hope, before long, to be able to show that practicable five-figure tables can be constructed to which the reproach of "size" will be inapplicable.

July 3. M. WHITE STEVENS.

PROF. PERRY in NATURE of July 2 (p. 198) gives an illustration of a method whereby the logarithms of the numbers from 1000 to 2000 may be got from a four-place logarithm table with an error of, at most, one unit in the last place.

It is, however, somewhat difficult to see what advantage this arrangement has over the one where the logarithms of the numbers 1000 to 2000 are given (again) after 999 *in extenso* without proportional parts.

By this latter system the tables are certainly increased in size by another double page, but, on the other hand, there is a decided disadvantage in using the relatively large proportional parts for the numbers 1000 to 2000. If the addition of the proportional parts is done on paper, time will be lost; if the addition is done mentally, mistakes may easily occur. C. E. F.

Edinburgh, July 4.

IN mathematical tables the last figure in any tabulated number or difference must be liable to an error $\pm\frac{1}{2}$. When a number is extracted from the tables by aid of a tabulated difference, the result is subject to a duplication of error, that is, to an error ± 1. It will be found on examination that in some of the early numbers of the ordinary four-figure log tables the error is often double this amount. Mr. Harrison's alteration remedies this mistake, and makes the maximum error uniform throughout. The scheme proposed by Mr. Stevens can do no more than this, and would be more clumsy. The figures given by him apparently refer to averages, and are irrelevant.

If the proposal of C.E.F. were adopted, the first portion of the table would have double the accuracy of the remainder; the result of any general calculation would depend on the accuracy of the latter, and little, if anything, would be gained in return for the fact that the space occupied by the tables would be doubled. JOHN PERRY.

A Multiple Lightning Flash.

I HAVE had the privilege of examining the print of the lightning flash taken by Mr. C. H. Hawkins, of Croydon, and referred to in NATURE (July 16, p. 247) by Dr. W. N. Shaw.

The main flash consists really of *three* flashes, the several paths of which are not quite coincident. If a moving camera had been employed (I assume the camera in this case was fixed), then I think the three flashes would have been easily distinguished. The flash on the right is evidently a ramification of the main stream. Except for the above, the photograph shows no other special features.

WILLIAM J. S. LOCKYER.

Solar Physics Observatory, July 17.

The Lyrids, 1903.

THE return of the Lyrids this year was well observed here. Watching was begun on April 15, and continued until April 24, the series being broken only once, namely on April 20, when the sky was overcast. The weather was very favourable, the heavens on most nights being beautifully clear. Eighty-four meteors were registered, of which twenty were Lyrids.

The chief points with regard to the Lyrids brought out by the observations are:—

(1) The display was of moderate strength.

(2) The maximum occurred on April 21 and 22, probably more precisely at midnight on the latter date.

(3) The decrease in activity was more rapid than the rise to maximum.

(4) The radiant on the nights of April 21–22 was at $271\frac{1}{2}^\circ+33^\circ$ (12 paths).

(5) The colours of the Lyrids were almost wholly of two shades, white and a peculiar yellowish, dirty-looking green.

(6) The meteors were swift, their average angular velocity being 20° a second, not taking into account those which appeared close to the radiant. The real speed of a Lyrid fireball recorded on April 22 by Prof. Herschel at Slough and the writer at Leicester has been computed to have been 39 miles per second.

(7) Only the very brightest Lyrids left streaks.

The first meteor of the shower was observed on April 17. There was a remarkable break on April 19, when not a single Lyrid was seen in a watch lasting three hours, though the seeing was excellent.

Minor Showers.

Besides the Lyrids, radiants were found for the chief active showers as under:—

Radiant-point	Duration	No. of meteors	Remarks
° °			
330 +35 ...	March 29–April 24 ...	4 ...	Slowish; radiant well-defined.
216 −26 ...	April 11–24 ...	5 ...	Rather swift, bright, long. Exhibited great variety of colour.
$236\frac{1}{2}+51\frac{1}{2}$...	April 19 ...	4 ...	Short; rather swift. Radiant sharply defined.
$256\frac{1}{2}+37$ ...	April 19–22 ...	6 ...	Swift. Maximum April 22 (5 meteors).

The shower from 216°–26° is very interesting, inasmuch as nothing seems to have been seen of it previous to 1900, in which year it was very active at the Lyrid epoch from 218°–31°. It appears, therefore, to furnish quite a strong display at this period.

A recent writer has calculated that the maximum of the Lyrid shower would fall this year at April 19, 10h. 30m. My observations entirely negative this conclusion, for that night was marked by the complete absence of Lyrids, though the seeing conditions were extremely favourable. The time of maximum actually found was in accordance with that which had previously been inferred. Since in the last few years the maximum has taken place on the 20–21, it was to be expected that, after the omission of leap year in 1900, the epoch would be thrown one day later. ALPHONSO KING.

Leicester, July 11.