substance unaccompanied by its enantiomorph. The possibility of such an occurrence has been pointed out by Profs. Karl Pearson and Fitzgerald, and is of course open to no doubt. Indeed, to use Dr. Japp's own simile, it must be conceded that if the type were jumbled an infinite number of times, it would lead not only once but an infinite number of times also to the text of *Hamlet* being set up! In the matter of the synthesis of asymmetric molecules throughout the past history of the earth we are, it is true, not dealing with an infinite number of events, but still with a number of an extremely high order, and in the course of this enormously long series of events such an exceptional occurrence as the exclusive production of a considerable aggregation of similarly asymmetric molecules may have taken place. This Prof. Japp himself appears to recognise, but he does not admit that such an aggregation of asymmetric molecules can by "breeding" add to the number of asymmetric molecules which are unaccompanied by their enantiomorphs, and he has disposed of the vague suggestions of such breeding advanced by his critics. He appears to me, however, to have overlooked one possible way in which such breeding can occur. If we take an asymmetric molecule containing for simplicity a single asymmetric carbon atom, and by purely chemical synthesis generate a second asymmetric carbon atom in the molecule, the new carbon atom may, as we know from the researches of Emil Fischer, always have the same asymmetry, to the exclusion of its enantiomorphous arrangement. But these asymmetric molecules containing two asymmetric carbon atoms might by purely chemical processes be broken down so that each yielded two molecules containing an asymmetric carbon atom apiece. Each of these two resulting molecules with their single asymmetric carbon atom would now be ready to go through a similar cycle of changes which would result in four molecules, each containing a single asymmetric carbon atom, and so on. In this manner an indefinitely large number of asymmetric molecules, unaccompanied by their enantiomorphs, might be bred from a single one without the interference of any asymmetric agency, living or otherwise.

It appears to me also quite possible that the asymmetry of solar radiation may originally have determined the exclusive synthesis of one enantiomorph, and that the latter was in some way or other utilised in the evolution of the first organism, by which then this particular enantiomorphism was further transmitted indefinitely. This is an entirely different idea from that which led Pasteur to try his celebrated but abortive experiments on plants in the hope that by reversing the asymmetry of the sun he would obtain the vegetable asymmetric products of the reverse sign to that which they normally possess. When Pasteur became a biologist as well as a chemist, he rapidly realised that the asymmetric influences present in the germ of life itself far outweigh the asymmetric influence of solar radiation in determining the formation of one enantiomorph to the exclusion of its fellow. It has indeed always appeared to me highly remarkable that Pasteur should have embarked on these particular experiments at all, inasmuch as the negative answer to his inquiry is already given by nature; for, as Prof. Japp points out, the asymmetry of solar radiation in the northern is the reverse of that in the southern hemisphere, whilst the asymmetric vegetable products in both hemispheres are identical and not enantiomorphous. PERCY F. FRANKLAND.

Mason University College, Birmingham, October 31.

The November Meteors.

PROF. J. COUCH ADAMS, in his classical investigation into the dynamics of the great Leonid swarm, employed Gauss's method in determining the perturbations of the surrounding planets upon these meteors. Gauss's method furnishes the average amount of each perturbation, and although this was sufficient for the immediate object which Prof. Adams had in view, it has appeared desirable to penetrate more deeply into the problem.

With this end in view the actual perturbations during the 33¼ years of the present revolution are being computed under the direction of Dr. Downing, F.R.S., the Superintendent of the Nautical Almanac, the calculations being made for meteors occupying a definite position in the stream, viz. that through which the earth passed in 1866. This computation will be completed within the next few days; and as the result, so far as the motion of the node is concerned, can be made the basis of an attempt to forecast the times of the greater showers—one of which may possibly present itself next week—it seems desirable that this use shall be made of the work which is being done.

The greater Leonid showers are occasioned by the earth passing through the stream of ortho-Leonids, *i.e.* those numerous Leonids which revolve round the sun in nearly identical elliptic orbits. There are other Leonids moving in orbits that sensibly differ from the ortho-orbit, and these may be called clino-Leonids. Some of the clino-Leonids encounter the earth in rather scattered formation every year, but the ortho-Leonids are a dense procession of meteors advancing along nearly coincident paths and occupying only a portion of the orbit at any one time.

It is just possible that the front of this procession may extend far enough forward for the earth to encounter it this year, and we are almost certain to pass through the stream in the Novembers of next year and of one or two of the following years. On each such occasion the earth receives a downpour of meteors which lasts for so few hours that those observers only who are fortunate enough to be on the advancing side of the earth can witness the marvellous display.

If there is one of these greater showers this year; if the meteors that shall constitute it traverse the same orbit as did those that the earth encountered in 1866; and if the advance of the node since 1866 were the same as that assigned by Gauss's method: then would the middle of the shower of this year occur at the time

1898 November 14d. 5h.

But the computation which is being made under Dr. Downing's direction shows unmistakably that the last of these conditions has not been fulfilled, that on the contrary the perturbations during this revolution, especially those arising from Jupiter and Saturn, have been far above the average.

Now all the calculations which have been made refer to meteors situated at what we may call Station A in the procession, by which is meant that part of the stream through which the earth passed in 1866. This part of the stream will not return to the node—the point of intersection between the meteoric orbit and the earth's orbit—till the end of January 1900. Accordingly Station B, which the earth will encounter this year, is situated in the procession about a year and a quarter in advance of Station A.

The relative positions of the disturbing planets and the meteors make it almost certain that meteors B have suffered perturbations during the current revolution, which sensibly differ from those affecting meteors A; but the difference is probably not very large. Again, they may have started along slightly different orbits. And, thirdly, Adams's orbit can only be relied on as approximate, since it is based on an insufficient determination of the radiant.

On these accounts there is risk of error in applying to meteors B, the results obtained in the case of meteors A.

With these reservations we may venture to make the correction; and accordingly it is intended as soon as the computer's work is sufficiently advanced, to send to the daily papers (since NATURE will be published too late) an announcement of the amount of the correction found in the case of meteors A. It will probably correspond to an epoch, several hours, possibly more than a whole day, later than that calculated on the average shift of the node.

If when the correction is published it is applied to the date given above, viz. to 1898 November 14d. 5h. (5 o'clock in the afternoon of Monday the 14th instant), it will furnish the best attempt which the data at our disposal seem to permit, to assign the time of the great shower if such an event occurs this year. It will be understood that this can only be offered as a prediction with the important reservations enumerated above.

Everything as yet known seems to betoken that the true time will prove to be many hours later than 5 o'clock on Monday afternoon, so that if one of the great meteoric showers reaches the earth this year it may perhaps happen on Monday night after half-past ten, or on Tuesday night after the same hour, in either of which events it will be visible from all stations on this side of the earth where the sky is not clouded.

G. JOHNSTONE STONEY.

8 Upper Hornsey Rise, N., November 6.