

midnight of each day to the succeeding midnight. The following table exhibits each prediction and the weather that followed:—

Prediction.		Weather.				Prediction.		Weather.			
(1)	(2)	7	3	10	rain	(1)	(2)	7	3	10	rain
rain	rain	cloudy	cloudy	clear	.05	fair	fair	clear	clear	clear	0
rain	rain	fog	clear	cloudy	.02	fair	threat.	fair	cloudy	cloudy	.01
rain	threat.	cloudy	fair	clear	0	fair	threat.	cloudy	clear	clear	0
fair	threat.	clear	fair	cloudy	0	rain	fair	clear	cloudy	cloudy	0
fair	threat.	clear	fair	fair	0	rain	rain	lt. rain	cloudy	cloudy	.96
fair	fair	clear	fair	fair	0	fair	fair	clear	cloudy	cloudy	0
fair	fair	cloudy	cloudy	cloudy	0	fair	fair	clear	fair	clear	0
rain	rain	lt. rain	cloudy	cloudy	.76	fair	fair	cloudy	cloudy	cloudy	0
fair	fair	fair	fair	clear	0	rain	threat.	clear	clear	cloudy	0
fair	fair	fair	cloudy	clear	0	fair	fair	fair	cloudy	cloudy	0
fair	fair	clear	cloudy	clear	0	th.	fair	cloudy	cloudy	fair	0
fair	fair	clear	clear	clear	0	rain	threat.	cloudy	clear	fair	0
						th.	fair	fair	cloudy	fair	0

It will be seen that the prediction was the same in fifteen cases, and eleven of these were fully verified. In order to obtain a fair comparative estimate for the remaining ten days, the predictions and the succeeding weather were referred to Prof. I. Russell, who decided that No. (1) agreed better with the weather twice, and No. (2) eight times. If these ten be regarded half verified, we shall obtain for No. (1) 48 per cent and No. (2) 60 per cent.

The predictions were also referred to Professor Upton, who suggested two schemes for verification, by one of which he computed No. (1) 67.2 per cent, and No. (2) 69.6 per cent; and by the other, No. (1) had 61.0 per cent, and No. (2) 65.0 per cent. As Professor Upton preferred the second scheme, I give it in detail. His plan was as follows:—

Arrange all possible weather-combinations in a table, and give to each prediction a certain weight according to its position in the table, as follows:—

Weather.			Predictions.		
			fair	threatening	ra
clear	clear	clear	3	0	0
clear	clear	fair	4	1	0
clear	fair	fair	4	1	0
fair	fair	fair	4	1	0
clear	clear	cloudy	3	2	0
clear	fair	cloudy	3	2	0
fair	fair	cloudy	3	2	0
clear	cloudy	cloudy	2	3	1
fair	cloudy	cloudy	2	3	1
cloudy	cloudy	cloudy	1	4	2
trace	of	rain	0	3	3
	rain		0	2	4

In this scheme it is possible that too much weight has been given 'fair,' and too little 'threat.' However, as the prediction 'threat,' seems of doubtful utility, it should have less weight.

This discussion has brought out one fact of great interest regarding methods of verification. Mr. Clayton verified the same predictions by the observations at Blue Hill, a station very near Boston. He makes the percentage 85. This great difference of 24 per cent seems very surprising, and can hardly be due to the difference in weather at the two places. It seems probable that this difference is due to the method of verification, and that a mere percentage obtained from an arbitrary verification cannot be relied on for com-

paring the relative merits of two predictions. It is to be hoped that a further discussion of this question may lead to clearer light and understanding of the methods of prediction and verification best suited to the needs of the public.

H. A. HAZEN.

Washington, D.C., Dec. 14.

### The Chinese Wall.

THE note on the Chinese wall in a late issue of *Science* (x. No. 253), calling attention to Abbé Larrieu's assertion that the wall does not exist, recalled to mind Abbé Huc's account. Turning to it, I find that he was a believer in it, and with good reason. In Vol. II. of his 'Journey through Tartary, Thibet, and China,' p. 31, he gives the following account, which may interest some of your readers, and serve to correct an erroneous impression:—

"The part of the wall immediately to the north of Pekin . . . is really fine and imposing; but it must not be supposed that this barrier is equally large and solid throughout its whole extent. We have had occasion to cross it at more than fifteen different points, and have often travelled for days together without ever losing sight of it; and instead of the double battlemented stone wall which is seen at Pekin, it is sometimes a very humble-looking wall of clay; and we have even seen it reduced to its simplest expression, and composed only of stones piled up together."

Thus, though the wall may not and does not have the magnitude and solidity often attributed to it, yet in one form or another it certainly seems to exist, and is not, as we are told Abbé Larrieu says, 'a huge Chinese lie.'

JOSEPH F. JAMES.

Miami Univ., Oxford, O., Dec. 20.

### Tornado Force.

I SEND you some facts in relation to tornado force and its peculiarities of action, which may not be uninteresting to your readers, on either side of the question, involving the nature of the force or forces.

The tracks examined by me did not present continuous lines of destruction, but areas of destruction separated by intervals entirely or almost entirely exempt from destructive forces, from which it is inferred, that while the storm, in its common and ordinary features, pursued its way steadily onward by bodily transference, the tornadic action was developed interruptedly, and progressed by successive transplantings.

The first area examined, tornado of April 23, 1883, was composed of two distinct parts. The first was a long rectangular space of about half a mile in length, from west-south-west to east-north-east, and a hundred and fifty to two hundred yards in width. Within this space the trees were prostrated from south-east, south, south-west, and west, and intermediate points; and, wherever two or more were found lying across each other, the one thrown from the direction nearest to east, or farthest round from west, was always at the bottom. Thus, those thrown from south always lay on top of those from south-west, those from south-west on top of those from south and south-east, and those from west were always on top of all other directions. This order was without an exception. The rectangular area terminated at the east end in an irregularly circular area of about eight hundred yards diameter, either east and west or north and south. Bisecting this area both ways, and dividing it into four quadrants, the south-west and south-east were found to correspond in all respects with the rectangular area, except that in the south-east there was a greater proportion of trees thrown down from east-south-east and south-east than in the other sections; and in the south-west quadrant, near the centre, a tree thrown from south-west was overlain by one from south, the single exception to the order noted above. In the north-east quadrant the destruction was less than in either of the others, and trees were thrown down from east, north-east, north, north-west, and west. In the north-west quadrant the trees were thrown from north, north-west, and west, chiefly from north-west, west-north-west, and west; and in the instances where they crossed each other, the order in relation to the west was similar precisely to that of the other parts, progressing from east round by north to west, as, on the other side, the progression was from east round by south to west; so that in these, the north-east and north-west quadrants, trees thrown from north-east lay under those from north, those from north under those from