

The Velocity of the Argentine Earthquake Pulsations of October 27, 1894.

IN several recent notes in NATURE (pp. 232, 371, 393), attention has been drawn to the great Argentine earthquake of last October 27, and to the record of its pulsations in Europe. In one of these (p. 371) a rough estimate is given of the velocity, but a more detailed one seems desirable on account of the great distance traversed by the pulsations.

According to M. Noguès (*Comptes rendus*, vol. cxx. pp. 167-170), the epicentral tract includes Rioja, San Juan and Mendoza. There is thus some uncertainty as to the exact position of the spot from which the pulsations started. In the following estimate I have supposed it to coincide with San Juan.

San Juan is about 312 km. from Santiago, and 11,600 km. from Rome, the difference being 11,288 km. The earthquake was registered by a seismograph at Santiago at 8h. 50m. 26s. p.m., Greenwich mean time. The slight preliminary pulsations were recorded by the great seismometrograph at Rome at 9h. 7m. 35s., the first maximum at 9h. 49m. 50s., and the principal maximum at 9h. 55m. 40s. Assuming that the first maximum (or beginning of the larger pulsations) corresponds to the movement which started the seismograph at Santiago, it follows that the distance of 11,288 km. was traversed by the pulsations with an average velocity of 3'17 km. per second.

It should be remarked that this estimate agrees very closely with those obtained for the same phase of the movement in the cases of the Greek earthquake of April 27, and the Constantinople earthquake of July 10, 1894 (namely, 3'21 and 3'20 km. per sec. respectively).

For the first slight movements recorded at Rome, Charkow and Nicolaiew, we must admit either that the pulsations producing them started some time before the great earthquake, or else that they travelled with a far higher velocity. If they left San Juan simultaneously with the larger pulsations (*i.e.* at 8h. 48m. 48s.), their average velocity must have been 10'38 km. per second. The horizontal pendulums at Charkow and Nicolaiew also recorded these early movements, beginning at 9h. 8m. 36s. and 9h. 12m. 6s. respectively; soon after which the curves more or less completely disappeared. San Juan is about 13,625 km. from Charkow and 13,240 km. from Nicolaiew, the average velocities to these places being therefore 11'47 and 9'47 km. per second. The latter obviously corresponds to a later phase of the movement.

Whether the slight preliminary pulsations start before, or at the moment of, the earthquake, is a question of the greatest practical importance from the point of view of earthquake-warnings. To answer it, one of the Italian seismometrographs or a horizontal or bifilar pendulum should be placed beside a seismograph in the immediate neighbourhood of the centre of disturbance.

C. DAVISON.

Birmingham, March 6.

The Society of Spelæology.

THE attention of your readers has already been called to the formation of this Society in Paris (NATURE, January 3), the promotion of which is due to the action and enthusiasm of M. E. A. Martel, the author of the beautifully-illustrated work "Les Abîmes," reviewed by Prof. Bonney in your pages of the 28th ult. This book describes and illustrates a number of extraordinary and often hazardous subterranean explorations in the underground caves and watercourses of the limestone districts of France, Belgium, Austria, and Greece. The Society is intended to carry on the work thus initiated by M. Martel and his devoted co-workers in a more effective manner, and over a wider area than has been possible by private enterprise. The formation of the Society, M. Martel writes me, is now an accomplished fact. About 130 gentlemen of all nationalities, some of whom bear well-known names in the ranks of science, have signified their adhesion. A provisional code of rules has been printed and adopted, and a meeting has already taken place, under the presidency of the president-elect, M. F. Deloncle, Deputy for the Basses-Alpes.

The first article of the rules states the object of the Society as follows:—"The Society of Spelæology is instituted in order to ensure the exploration—to facilitate the general study—to co-operate in the regulation or utilisation—of subterranean cavities of all sorts, known or unknown, whether natural or

artificial; to encourage and aid with funds investigations relating thereto; in a word to popularise and develop in a way, at once practical and theoretical, utilitarian and scientific, researches of all kinds in the interior of the earth." The subscription for ordinary members is fifteen francs per annum. It is intended to publish a quarterly bulletin; to a copy of which each member will be entitled.

In order to fully carry out the objects of the Society, the programme of which is a comprehensive one, more members are required, and I shall be glad to furnish any of your readers who may wish to join the society with the proposal form or *Bulletin d'Adhésion*, or they may be obtained from M. Martel, General Secretary, 8 Rue Ménars, Paris.

M. Martel, I may say, is desirous of extending his investigations to the British Isles, if sufficient inducement be offered in the exploration of some large cave, as yet unworked or imperfectly known, and where his apparatus of rope ladders, collapsible boats, &c., would be useful aids. Information on this head will be thankfully received by me.

MARK STIRRUP.

Bowdon, near Manchester, March 6.

Contraction of Trees caused by Cold.

THE splitting of forest trees by frost is often ascribed to the same cause which bursts a pipe charged with water when the temperature falls below 32° F., namely, the expansion of the water on turning into ice. Botanists know that this is not so, but the splitting is owing to a contraction of the wood by frost, similar, but in a less degree, to what happens when the wood is dried. With the thaw the trees expand to their original dimensions. Evidence of such contractions and expansions is furnished by the measurements herewith.

For some years past, I have regularly taken the girths of a number of forest trees during summer, in order to note the amount of growth. To do this accurately I have to use a steel tape, and of course to girth the trees at exactly the same place. My experience, thus acquired in measuring to a nicety, is a sufficient reason for confidence that the following figures are substantially correct.

Girth of trees in October 1894, when done growing and before the frost.		Girths, February 8, 1895, 9 a.m. Temp. 3° F.	Girths, March 2, 1895, 3 p.m. Temp. 39° F.	Amount of contraction with frost.
No.	Inch.	Inch.	Inch.	Inch.
1	Sycamore...26 $\frac{3}{8}$	26 $\frac{3}{8}$	26 $\frac{3}{8}$	$\frac{1}{8}$
2	Sycamore...22 $\frac{1}{2}$	22 $\frac{3}{8}$	22 $\frac{1}{2}$	$\frac{1}{8}$
3	Sycamore...33	32 $\frac{3}{8}$	33	$\frac{1}{8}$
4	Elm ... 28 $\frac{7}{16}$	28 $\frac{1}{2}$	28 $\frac{7}{16}$	$\frac{1}{16}$
5	Elm ... 22	21 $\frac{3}{8}$	22	$\frac{1}{8}$
6	Elm ... 19 $\frac{9}{16}$	19 $\frac{3}{8}$	19 $\frac{9}{16}$	$\frac{1}{16}$
7	Ash ... 46 $\frac{1}{8}$	45 $\frac{1}{8}$	46 $\frac{1}{8}$	$\frac{1}{8}$
8	Oak ... 42 $\frac{1}{2}$	42 $\frac{3}{8}$	42 $\frac{1}{2}$	$\frac{1}{8}$
9	Oak ... 17 $\frac{9}{16}$	17 $\frac{1}{2}$	17 $\frac{9}{16}$	$\frac{1}{16}$
10	Oak ... 35 $\frac{1}{8}$	34 $\frac{1}{8}$	35 $\frac{1}{8}$	$\frac{1}{8}$
11	Beech ... 21 $\frac{1}{2}$	21 $\frac{1}{8}$	21 $\frac{1}{2}$	$\frac{3}{8}$
12	Beech ... 32 $\frac{1}{2}$	32 $\frac{1}{8}$	32 $\frac{1}{2}$	$\frac{1}{8}$
13	Beech ... 42 $\frac{1}{2}$	41 $\frac{1}{2}$	42 $\frac{1}{2}$	$\frac{1}{8}$

Bradford, March 4.

J. CLAYTON.

The Barrenness of Precambrian Rocks.

REFERRING to the paragraph in NATURE (February 28, p. 423), on the sudden appearance of a rich fauna in the Lower Cambrian rocks, I should like to make a suggestion for the consideration of geologists. May not the extreme poverty of organic remains in Precambrian (Archæan) strata be largely due to a scarcity of carbonate of lime in the water of the Precambrian seas? The Uriconian and Longmyndian rocks of Shropshire, which, at the very least, must include five miles of sediment, comprise hardly a scrap of limestone. The same remark will apply to the Precambrian strata of Charnwood, South Wales, the mainland of North Wales, and the great Torridonian group of Scotland. The Pebidian rocks of Anglesey contain bands of limestone, it is true, but it is highly probable that they are of chemical origin, and not derived from oceanic waters. There are, of course, plenty of limestones in the older Archæan rocks of North America, and a few of them in the Lower Archæans of