

two *savants* did not commence before 1692. It is therefore out of the question to credit Leibnitz with the invention of the steam-engine or even with the application of the piston principle in the steam-engine.

E. GERLAND

Cassel

A Question for Naturalists

MR. PAUL DU CHAILLU, in his "Land of the Midnight Sun," tells us that "the time of dropping the horns in a herd (of reindeer) varies from March to May." This may be true as regards the young males up to two or three years of age, and of the does, but it is questionable as regards the full-grown males. If my memory serves me correctly, the full-grown bucks brought to this country with some Lapps a year or two ago, and exhibited at the Aquarium, shed their horns in December or January. The experience of a gentleman—one of the highest authorities in such matters—who holds a most important position at the Zoological Gardens, supports my view. Can the Lapps have two kinds of reindeer which shed their horns at different seasons? I know that the full-grown male reindeer of the barren grounds of America drop their horns in the latter part of November and in December (which does away with the erroneous idea that this animal used the broad brow antler as a shovel for clearing away the snow so as to reach his food); the young buck of two or three years retains his horns until spring, and the full-grown female does not shed her horns until May or June, usually after having dropped her calf.

J. RAE

4, Addison Gardens, November 19

Earthquake Vibrations

In a note in your issue of August 25 on my account of the earthquake of March 8, 1881, felt in Japan, it is said "that from the phenomena of the shock and from experiments on artificial earthquake waves produced by letting an iron ball weighing about one ton fall from a height of about thirty-five feet, Mr. Milne agrees that the waves that are felt are transverse to the line of propagation of the shock." Lest it should be thought that all the earthquakes which shake the residents in Japan are composed of transverse vibrations, allow me to make the following brief statements:—

1. In the earthquake of March 8 my seismographs chiefly indicated east and west motions, whilst time observations made in Yokohama, as compared with similar observations made in Tokio, showed that the earthquake must have travelled up from the south. This particular earthquake, as recorded in Tokio, might therefore be called a transverse or diagonal shock.

2. In other shocks normal or direct vibrations are the most prominent. These shocks might be called eutropic.

3. Others again are compounded of direct and transverse motions, and might therefore be called diastrophic. Thus my records of the shock of July 5, 1881, very clearly showed a variation in the direction of the motion of the ground. At the commencement of the shock the motion was N. 112° E.; 1½ second after this the direction was N. 50° E.; ¾ second more it was N. 145° E.; and after a similar interval N. 62° E. These and other changes were very clearly indicated in the diagram written by a double-bracket seismograph.

4. Anaseismic shocks, or those where vertical motion is prominent, which vertical motion may sometimes be a component of the transverse motion, appear to be rare.

5. In the artificial earthquakes produced by the blow of a falling ball the seismographs very clearly wrote both normal and transverse vibrations. When bracket-ring seismographs were used, these two sets of vibrations could be separated and their respective velocities, &c., measured. When a single component seismograph was used, the resultant motion due to the composition of these two sets of vibrations was recorded. The results of these experiments, which experiments were made in conjunction with my colleague Mr. T. Gray, will very shortly be published.

JOHN MILNE

Imperial College of Engineering, Tokio, Japan, October 13

The Geological Survey of Italy

MY friend Mr. W. Topley, in his interesting account of the Italian Geological Survey (*NATURE*, vol. xxv. p. 86), is quite right when he states that the geological surveyors seem now to have definitely fixed the position of the Carrara marbles in the Trias. If, however, he means to imply that the geological world

at large will accept this decision, I fear he is mistaken. The patient toil, spread over many years, and carried on by M. Coquand with more than due regard to Buffon's advice to geologists, "*Il faut voir beaucoup et revoir souvent*," gives him such authority when speaking on the structure of the Apuan Alps and the Campigliese, that nothing but the most absolute proof that he is wrong in regarding the metamorphic marbles of Carrara, as well as those of the Pyrenees (St. Béal, &c.), as being of Carboniferous age, will prevent foreign students of Italian geology from accepting his views on the matter. I have read, I think, all that has been written in Italy by De Stefani and others on the point in question since the publication in full of M. Coquand's mature conclusions in the *Bulletin de la Société géologique de France*, in 1874, and I still regard his position as entirely unassailed. In 1876 I published in the *Geological Magazine* a short *résumé* of M. Coquand's results, to which I would refer any who are interested in the subject. G. A. LEBOUR

OUR ASTRONOMICAL COLUMN

THE PROVINCIAL OBSERVATORIES OF FRANCE.—We have before us the "Rapport adressé par le comité consultatif des observatoires astronomiques de province, à M. le Ministre de l'Instruction Publique," signed by M. Lœwy, as reporter. In the year 1880 a great impulse appears to have been given to what is termed the reform of French astronomy, a considerable grant having been obtained by the Minister of Public Instruction, which allowed of most material improvement in the equipment of the several observatories of the provinces. Stress is laid upon the reorganisation of the observatory at Algiers, which is placed under the direction of M. Trepied, and the Committee urge that special attention should be given to the proper equipment of an establishment which has the advantage of so exceptional a climate. The observatory at Marseilles is still under the direction of M. Stephan, who has done such excellent work for many years past, and MM. Borrelly and Coggia were the assistant-astronomers in 1880: a revision of the star-catalogue formed by Rümker at Hamburg is in progress at Marseilles. At Toulouse, M. Baillaud is the director; he proposes to devote special attention to the observation of the variable stars. In 1880 a regular course of observations of the solar spots was maintained, and it is mentioned that during the nights August 9-13 three observers counted upwards of 1200 meteors of the Perseus shower. At the observatory of Bordeaux, M. Rayet is director; an equatorially-mounted refractor of 14-inches aperture has been ordered from Merz of Munich, and a second of 8-inches aperture is also to be provided. Two observers were engaged in 1880 upon a revision of the charts of Chacornac. The observatory at Lyons includes four stations, three of them devoted to meteorology; the astronomical station is at Saint-Genis-Laval, where M. André is director, and the principal instrument in process of construction in 1880 was a meridian-circle of 6-inches aperture by Eichens. The State-subvention to these observatories is 81,000 francs, and further funds are provided by the cities of Bordeaux, Marseilles, and Toulouse for their respective establishments.

The Report is a very encouraging one in its bearing on the advancement of practical astronomy in France.

DENNING'S COMET.—Dr. Hartwig has corrected his first eclipse with the aid of an observation by Prof. Winnecke on November 19, in addition to earlier ones at Marseilles and Strasburg, and now finds the period of revolution 8'8334 years, or 3226'4 days. With the corrected orbit the nearest approach to the orbit of Jupiter occurs in 222° 35', heliocentric longitude, where the distance is 0'154, the comet is at this point about 593 days before perihelion passage. It approaches nearest to the orbit of Venus 5'6 days after perihelion passage in longitude 30° 45', where the distance is only 0'0226, while in longitude 82° 35', about 36'7 days after perihelion passage the comet's distance from the earth's orbit is at a minimum of 0'0346.

A NEW COMET.—A Dunecht circular issued on November 22 contained elements of a comet from observations made by Mr. Wendell at the observatory of Harvard College, U.S., on November 17, 19, and 20. Prof. Winnecke has observed this comet as follows:—

	Strasbourg, M.T.			R.A.			Decl. N.						
	h.	m.	s.	h.	m.	s.	°	'	"				
Nov. 25	9	54	33	...	0	30	39	46	...	63	52	2	
	26	6	3	31	...	0	25	25	44	...	62	35	21

These places differ considerably from the ephemeris telegraphed to Dunecht.