South American Earthquakes

ON the 18th May, that is, the same day that, if the telegraphic news be correct, the cities of Cucuta, Santiago, and others were destroyed by an earthquake, a distinct and prolonged shock, preceded and accompanied by a loud rumbling noise, awoke the greater number of the inhabitants of this place, about a quarter of an hour before midnight. The direction of the phenomenon was thought by some who heard and felt it to be from east to west; but this opinion was, I have reason to believe, inaccurate.

Not knowing as yet the exact time at which the Columbian disaster took place, I am unable to calculate the rate at which the shock, connected with, one can hardly doubt, the great earthquake above alluded to, may have travelled the long distance that separates St. Thomas from Cucuta. Fuller details may subsequently, I hope, help to elucidate the matter.

It is worthy of note that whereas before the 18th May an unusually long period had elapsed during which no subterraneous vibrations had been felt in this island, there have occurred since that date several slight shocks at various hours of the day and night, with a frequency above the average.

St. Thomas, West Indies W. G. PALGRAVE

Glacier and other Ice

THE reviewer of Croll's "Climate and Time" in NATURE of the 24th June (p. 144) says: "What is there in this (Mr. Croll's) theory to distinguish a glacier from a common piece of ice? which on this principle ought to flatten out and not retain its shape as it does."

I believe that, independently of any theory of the cause of glacier motion, there is no physical difference whatever between glacier and other ice. The greater mobility of a glacier is merely due to its greater size and weight; just as water in a river-bed flows with very little friction, under a pressure that would not make it flow at all in a capillary tube. The plasticity of ice may however be shown on a small scale. I have read somewhere that a slab of ice supported only on its two ends will gradually bend down in the middle: and I have seen Prof. James Thomson at the Belfast Museum illustrate a lecture by moulding a few lumps of ice by pressure into the shape of a cup.

I am not writing in defence of Mr. Croll's theory of glacier motion. I believe the best explanation of those physical properties of ice on which glacier-motion depends is that given by Prof. James Thomson. I know Mr. Croll's theory only from your review, and I do not know how far it agrees with Prof. Thomson's. JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, June 26

The House-fly

I AM disappointed to find that no one has answered "Harrovian's" query in vol. xii. p. 126, as to the mortality amongst the house-fly, and the yellow powder which covered the carcase. I have noticed myself that house-flies often die in numerous company. I had an idea that it was owing to the temperature falling to its benumbing point, until I found the same thing happening while the thermometer was particularly high. Then I thought that all these dead flies might belong to the same brood, and having lived under almost exactly the same circumstances, their threads of life were spun out at almost exactly the same time. This new theory, again, did not stand examination well under the microscope. But the result of my experiment differed slightly from that of "Harrovian." At least I find I entered in my notes, "the body covered with white eruption, apparently a disease of the skin."

Denstone College, Uttoxeter D. EDWARDES

OUR ASTRONOMICAL COLUMN

AN ANCIENT "URANOMETRIA."—We have received a very interesting work, published by Dr. Schjellerup, of the Observatory of Copenhagen, under the auspices of the Imperial Academy of Sciences of St. Petersburg. It contains a description of the constellations, with the star magnitudes, composed in the middle of the tenth century by the Persian astronomer, Abd-al-Rahman al-Sûfi, and is a literal translation of two Arabic manuscripts preserved in the Royal and Imperial libraries of Copenhagen and St. Petersburg. A more particular account of the valuable addition which Dr. Schjellerup has made to the literature of astronomy will be given in this column next week. Meanwhile, we may just note one curious statement made by the Persian astronomer with reference to the well-known variable star Algol, viz., that at the time of his observations the star was *reddish*—a characteristic applied also to Antares, Aldebaran, *α* Hydræ, and a few other stars, which are also reddish in our own day; but at present there is no tinge of colour about Algol, which may be fairly described as a white star, and if there be one of its class more than another in which the periodical fluctuation of light can with much appearance of probability be attributed to the intervention of a revolving attendant, passing regularly in our line of sight, it is to this star that we might point in illustration. Its former ruddy light, however, rather necessitates a different explanation, and one which, notwithstanding the comparative regularity of its changes, may perhaps assimilate it to the more numerous class of variable stars.

THE "BLACK SATURDAY" ECLIPSE, 1598, MARCH 7.—This eclipse, which was visible in its total phase in Scotland, like that of 1652, April 8, noticed in this column last week, was remembered long afterwards in that country, the day of its occurrence being called "Black Saturday." The elements were very approximately as follows:—

Conjunction in R.A. 1598, March 6, at 23h. 1m. 38s. G.M.T.

R.A.	347° 44′ 8″		
Moon's hourly motion in R.A.	32 9		
Sun's ,, ,,	2 18		
Moon's declination	4 16 1	S.	
Sun's ,,	5 16 33	S.	
Moon's hourly motion in Decl.	17 8	N.	
Sun's ,, ,,	0 59	N.	
Moon's horizontal parallax	59 51		
Sun's ,,	9		
Moon's true semidiameter	16 19		
Sun's ,,	16 5		

The sidereal time at Greenwich noon on March 7 was 22h. 59m. 34s., the equation of time 11m. 33s. subtractive from mean time, and the middle of general eclipse at 22h. 10m. 29s.

Hence the following points upon the central track of the shadow:—

Long. 6° 21′ W., Lat. 51° 15′ N.	Long. 3° 14′ W., Lat. 55° 48′ N.
,, 4 17 ,, 54 12	,, 1 55 E. ,, 64 29
,, 3 45 ,, 54 59	,, 5 27 E. ,, 71 37

The semi-diameter of the belt of totality appears to have been about forty-five miles only. This belt included Edinburgh, where the total eclipse commenced about 10h. 15m. 36s. A.M. on March 7, local mean time, and continued 1m. 29s. with the sun at an altitude of 26°. At Douglas, Isle of Man, the eclipse was also total for about the same interval, the sun disappearing at 10h. 6m. 43s. A.M. local time according to the above elements.

The date for this eclipse is given for *new style*, as was also that for the eclipse of 1652.

While referring to this subject we may mention that Dr. Celoria, of the Observatory of Milan, has calculated the circumstances of the total solar eclipse of 1239, June 3, from the tables of Hansen—with Leverrier for sun. Prof. Schiaparelli had collected together a large number of notices of the totality of this eclipse in its passage across Italy, his authorities being chiefly found in the great work of Muratori. It appears to have been total (if we may assume totality from the visibility of stars and the night-like appearance of nature) at Monpellieri, Mirabeau (where Zach found an inscription referring to the phenomenon), Digne, Alessandria, Genoa, Piacenza, Parma, Lucca, Modena, Florence, Siena, Arezzo, Este, Ravenna, Lesina on the Adriatic, &c.; but Hansen's tables, accord-

ing to the calculations of Celoria, do not include the greater number of places within the belt of totality. It may be remembered that a calculation of the eclipse which occurred only two years later (1241 October), published by Hansen in the Transactions of the Saxon Society of Sciences, gave a total eclipse both at Erfurt and Stade near Bremen, where it is recorded to have been so observed, and hence his tables were considered satisfactory. Both eclipses may deserve further examination.

D'ARREST'S COMET.—This comet appears now to make a very close approach to the orbit of the planet Jupiter, from which circumstance it is possible that in some forty-five years from this time its elements may be entirely changed. Considerable perturbations from the attraction of this planet took place between the latter part of the year 1857 and the next period of the comet's visibility, so that by Leveau's calculations for that epoch the time of revolution had been increased sixty-eight days, the inclination diminished more than two degrees, with very material changes in the other elements. If we adopt the orbit found by Leveau for the last appearance, we have the following distances of the comet from the orbit of Jupiter at different points of heliocentric ecliptical longitude—equinox of 1872 :—

In	139°	1′	distance	0·411...Aphelion
	146	28	,,	0·292...Ascending Node
	150	0	,,	0·189
	152	0	,,	0·098
	153	0	,,	0·085

In longitude 153° 10′, which is about the point of nearest approach, the distance between the two orbits is only 0·0841. At this point the comet's radius-vector is 5·4254, with latitude 1° 52′ N., and it is passed 873 days or 2·39 years before the arrival at perihelion. Without very sensible perturbations in the mean time, the comet and planet would encounter each other at the latter end of the year 1920, when, as noted above, an entire change of orbit might take place.

THE MINOR PLANETS.—Inquiries are occasionally received for the fullest catalogue of elements of the minor planets. Such readers as have occasion to refer to a pretty complete list, will find the latest and most authentic summary in the "Berliner Astronomisches Jahrbuch" for 1877, where the orbits of upwards of 130 of these planets are given, and in many cases from new and complete discussion. Indeed, the preparation of elements and ephemerides of the minor planets forms a speciality of the "Berliner Jahrbuch" under the superintendence of Prof. Tietjen. The labour and practical difficulty attending this work have now become very great, so much so as to require almost exclusive devotion to it of a body of computers, if accurate results for the guidance of observers are expected. Prof. Tietjen to a considerable extent ensures this. The elements are collected by him in each successive volume, the latest being found as stated above in that for 1877, published within the last few months.

ON THE PLAGIOGRAPH aliter THE SKEW PANTIGRAPH

I HAVE been led by the study of linkages to the conception of a new instrument, or rather a simple modification of an old and familiar one, the Pantigraph, by means of which a figure in the act of being magnified or reduced may at the same time be slewed round the centre of similitude. Some of the readers of NATURE, such possibly as my able and most ingenious friends, Messrs. George Cayley and Francis Galton, may be able to pronounce with authority how far the invention is new and whether it is likely to be found in any way useful in practice as applied to the art of the designer or engine turner. Already my invention of the Isagoniostat, or equal angle setter, which I shall take some other opportunity to communicate to this journal, has been deemed available in practice for working automatically the train of prisms of a spectroscope.

In Fig. 1, A O B C Q represents an ordinary pantigraph. O is the fixed point, P is the tracer, and Q the corresponding follower ; then, as everybody knows, any curve traced out by P will be imitated by Q, and the two curves will be similarly situated in respect to O. The point of addition is the following :—

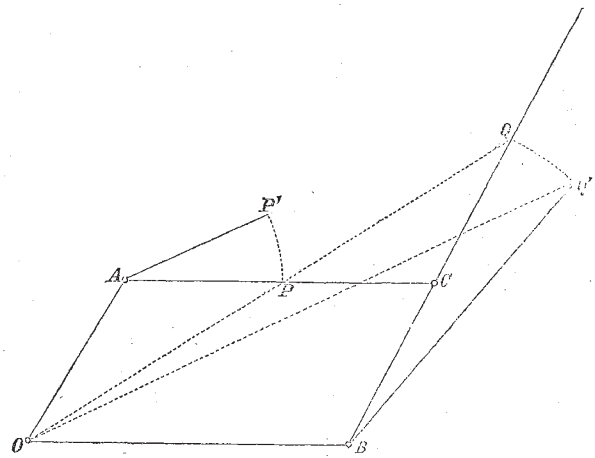

FIG. 1.

Let P be moved through any angle, P′ A P round A, and Q through *an equal angle* Q B Q′ in the *opposite* direction round B, and let P′ and Q′ be supposed to be in any manner rigidly connected with the bars A C, B C respectively. Then it admits of an easy proof that in whatever way the pointed parallelogram A O B C is deformed, O Q′ will bear to O P′ the constant ratio of A C to A P, and moreover the angle P′ O Q′ will always remain equal to the angles P′ A P, Q B Q.

It follows that whilst P′ is made to move upon any curve the follower Q′ will trace out a similar curve altered in magnitude, and at the same time turned round the first point O.

If, as in Fig. 2, we take A D equal to A C, B E equal to

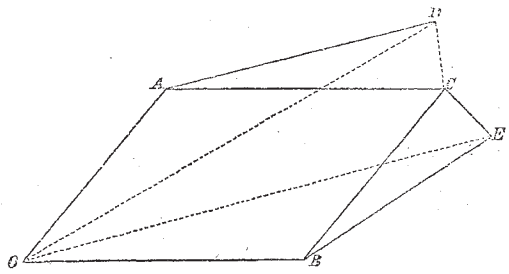

FIG. 2.

B C, and the angles C A D, C B E equal to each other, then the rays O D, O E will always remain equal and be inclined to each other at a constant angle. With this adjustment the instrument may be used to transfer a figure from one position in a sheet of drawing paper to any other position upon it, leaving its form and magnitude unaltered, but its position slewed round through any desired angle.

J. J. SYLVESTER

SCIENCE IN GERMANY

(From a German Correspondent.)

WHEN in 1819 Dulong and Petit measured the specific heats of some solid elements they found for each of the elements experimented upon, a very simple relation between its specific heat and its atomic weight : the product obtained by multiplying the specific heat