OUR ASTRONOMICAL COLUMN.

YALE COLLEGE OBSERVATORY.—The report of this Observatory for the year ending June 1889 has recently appeared. Mr. Brown, the Secretary, records the carrying out of several improvements in the grounds of the Observatory, and the continuation of the work of the Thermometric Bureau, 7475 thermometers having been received for verification during the year. Dr. Elkin, the astronomer in charge of the heliometer, completed the measures for the triangulation of the region near the North Pole during the summer of 1888, and the necessary reductions are well advanced. In October 1888 a series of observations for the parallax of Iris was commenced in connection with similar series to be effected at the Cape and at Leipzig, but measures were only obtained on thirty-four instead of sixty-five nights. In addition to these, however, 168 sets, each consisting of sixteen pointings, were obtained by Messrs. Elkin and Hall, for the diurnal parallax of the same planet. The discussion of the whole series of measures has been undertaken by the Yale astronomers, and the work has already been commenced. A series of measures for the parallaxes of Victoria and Sappho are now being undertaken, and it is expected that two additional observatories, those of Bamberg and Göttingen, will co-operate in the work. The heliometer has also been employed in further researches on stellar parallax; Procyon and Altair having been taken up by Mr. Hall, Vega and Regulus by Dr. Elkin. During the winter Mr. Hall completed the reductions of his work on the orbit of Titan; whilst Dr. Elkin took part in the observation of the total solar eclipse of January 1, 1889, which he observed from Winnemucca, Nevada, under very favourable circumstances.

NEW MINOR PLANET.—A new minor planet, No. 287, was discovered by Prof. Peters at the Clinton Observatory, on August 25.

Should the two planets discovered on August 3 both be confirmed as new bodies, that discovered by M. Charlois will be No. 285, whilst Herr Palisa's will be No. 286; the former having been discovered at 10h. 46m. G.M.T., and the latter at 11h. 27m.

COMET 1889 *d* (BROOKS, JULY 6.)—Dr. K. Zelbr has found elliptic elements for this comet, with a period of 12⅓ years. The ephemeris from these elements compares as follows with Herr Knopf's ephemeris which is given below:—

Zelbr-Knopf.

1889.	R.A. m. s.	Decl. ′
Sept. 8	− 2 17	+ 1·7
Oct. 2	− 5 49	+ 5·1

Herr Knopf's Ephemeris for Berlin Midnight.

1889.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Brightness.
Sept. 8	0 5 14	5 43·8 S.	0·3709	0·1333	1·34
12	0 3 51	5 39·0	0·3734	0·1353	1·31
16	0 2 21	5 34·0	0·3759	0·1386	1·28
20	0 0 48	5 28·6	0·3786	0·1430	1·25
24	23 59 15	5 22·4	0·3814	0·1487	1·21
28	23 57 47	5 15·3	0·3843	0·1554	1·16
Oct. 2	23 56 26	5 7·0 S.	0·3873	0·1632	1·09

The brightness on July 8 is taken as unity.

COMETS 1888 *e* (BARNARD, SEPTEMBER 2) AND 1889 *b* (BARNARD, MARCH 31).—The following ephemerides are in continuation of those given in NATURE for 1889 August 1:—

1889.	Comet 1888 *e*. R.A. h. m. s.	Decl. ° ′	Comet 1889 *b*. R.A. h. m. s.	Decl. ° ′
Sept. 7	18 32 7	8 46·3 S.	4 25 52	2 13·1 N.
11	18 27 51	9 9·2	4 17 53	1 1·8 N.
15	18 24 14	9 30·3	4 8 52	0 15·0 S.
19	18 21 15	9 49·8	3 58 47	1 37·1
23	18 18 47	10 7·8	3 47 36	3 3·9
27	18 16 50	10 24·4	3 35 21	4 34·5
Oct. 1	18 15 19	10 39·7 S.	3 22 1	6 7·4 S.

REDUCTION OF RUTHERFURD'S PHOTOGRAPHS OF THE PLEIADES AND PRÆSEPE.—Two papers by Dr. B. A. Gould have recently been published in the memoirs of the National Academy of Sciences, which possess a very special interest at the present time, for they show that in the very dawn of astronomical photography, it was possible to determine the relative places of the members of a star-cluster from a series of photographs with a precision comparable to that attained even with a heliometer. In 1865, Rutherfurd had obtained a number of photographs of the Pleiades, and early in 1866 he placed the results of his measurements of these plates in the hands of Dr. B. A. Gould, who deduced from them the R.A.'s and Decls. of nearly fifty stars of the group, and who, further, compared these results with the heliometer measures of Bessel, made more than a quarter of a century earlier. The comparison, even as it stood, was a most satisfactory one, for, in spite of imperfections in the method of measuring the photographs, such as naturally occurred in a first essay, the probable error of a measure, either of distance or position, appeared as small for the photograph as for the heliometer, and the general agreement of the two methods was most gratifying. The paper in which this discussion was given, though presented to the Academy on August 11, 1866, has only recently appeared—a regrettable delay, for it might well have been that so striking a demonstration of the possibilities of the photographic method might have insured its adoption by astronomers a decade, or even two, earlier than has actually been the case. Dr. Elkin has now (*Astron. Jour.* No. 197) compared Dr. Gould's places of the Pleiades with values interpolated between the Königsberg heliometer places for 1840, and the Yale places for 1885, and after clearing the photographic results for some systematic errors thus disclosed, he finds the residuals very small indeed. Of sixty-eight values, only one exceeds 0″·38, and forty-seven are less than 0″·20, nor do they show any systematic character depending on distance or direction from the centre of the field. The probable error of a co-ordinate from the photographic measurements, he deduces as:—

For the brighter stars, ± 0″·079,
,, fainter ,, ± 0″·101.

Dr. Elkin concludes, therefore, that "the smallness of these probable errors must be convincing proof that in photography we have really a means of investigation for micrometric work at least on a par with any existing methods as regards magnitude, and doubtless far surpassing them in ease of measurement and output of work."

The paper on Rutherfurd's photographs of the Præsepe was presented to the Academy on April 14, 1870, and the central star to which the others were referred being a small one, instead, as in the Pleiades, of a very bright one, which had been, therefore, always much over-exposed, the results were even more satisfactory.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 SEPTEMBER 8-14.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on September 8

Sun rises, 5h. 26m.; souths, 11h. 57m. 27·9s.; daily decrease of southing, 20·6s.; sets, 18h. 29m.: right asc. on meridian, 11h. 8·4m.; decl. 5° 32′ N. Sidereal Time at Sunset, 17h. 41m.

Moon (Full on September 9, 13h.) rises, 18h. 37m.; souths, 23h. 35m.; sets, 4h. 44m.*: right asc. on meridian, 22h. 47·7m.; decl. 12° 20′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	7 43	13 22	19 1	12 33·5	4 47 S.
Venus	1 49	9 30	17 11	8 40·3	18 5 N.
Mars	2 56	10 23	17 50	9 33·7	15 45 N.
Jupiter	14 50	18 43	22 36	17 54·6	23 27 S.
Saturn	3 32	10 47	18 2	9 57·4	13 44 N
Uranus	8 38	14 4	19 30	13 15·3	7 20 S.
Neptune..	21 12*	5 2	12 52	4 11·7	19 26 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Sept.	h.	
10	19	Mercury at greatest distance from the Sun.

Meteor-Showers.

	R.A.	Decl.	
Near ξ Persei	60°	37° N.	Swift; streaks.
,, Aldebaran	72	14 N.	,, ,,
,, Vega	282	42 N.	Swift; bright.
	354	38 N.	Very swift.

Variable Stars.

Star.	R.A. h.	m.	Decl. °	′			h.	m.	
Algol	3	1·0	40	32 N.	Sept.	14,	2	3	*m*
W Tauri	4	21·7	15	51 N.	,,	11,			*m*
X Boötis	14	18·9	16	49 N.	,,	10,			*m*
U Coronæ	15	13·7	32	3 N.	,,	9,	23	43	*m*
U Ophiuchi	17	10·9	1	20 N.	,,	8,	1	33	*m*
			and at intervals of				20	8	
X Sagittarii	17	40·6	27	47 S.	Sept.	9,	1	0	*M*
W Sagittarii	17	57·9	29	35 S.	,,	14,	23	0	*m*
U Aquilæ	19	23·4	7	16 S.	,,	12,	3	0	*m*
η Aquilæ	19	46·8	0	43 N.	,,	8,	1	0	*M*
X Cygni	20	39·1	35	11 N.	,,	8,	21	0	*M*
T Vulpeculæ	20	46·8	27	50 N.	,,	9,	21	0	*M*
R Vulpeculæ	20	59·5	23	23 N.	,,	11,			*M*
δ Cephei	22	25·1	57	51 N.	,,	10,	22	0	*M*

M signifies maximum; *m* minimum.

GEOGRAPHICAL NOTES.

FROM advices just received from Queensland the *Colonies and India* understands that Sir William MacGregor left Port Moresby, for the ascent of Mount Owen Stanley, on April 19, in an open boat, with a party of fourteen for Vanapa River, 30 miles westward. He arrived safely, and pushed the boat up river for eight days, during which period he encountered many difficulties in crossing rapids and dragging the boat over rocks. When he could get no further he camped on the left bank of the river and sent Mr. Cameron (his secretary) back to Port Moresby for supplies, with native carriers to cross the mountain. Mr. Cameron returned with two boats loaded with provisions, thirty natives, and six Polynesians. All being ready, on May 17 the party, comprising forty-two men, left the camp, all packing, and the Governor taking the heaviest load. There were only four whites in the party. They crossed Mount Gleason at Eyton Junction, and then shaped a course north-east by east. At a height of 175 feet they crossed Mount Gunbar, next Mount Kulwald. Mount Belford was crossed at the Joseph River, after which they descended to the Goodwin Spur, and saw the first native house at Goodwin's village, Mount Musgrave, where they camped, the Governor going ahead with four Polynesians and seven natives; then ascended Mount Musgrave for over 7000 feet to Vanapa River and Mount Knutsford Range, over rough country; they followed a spur leading west. After three days' march they descended the spur, and began the ascent of Mount Owen Stanley on June 9, reaching the top on June 11 and 12, returning to Mount Musgrave on June 16. All hands started homewards and arrived at River Camp on June 22. They left on June 23, visited a mountain village on June 24, and met the steam launch from the *Merrie England*, which was searching for the Governor's party, and took them in tow. They arrived at Mana Mana on the 25th, and were taken on to Port Moresby, where the party landed after two months, all well. The only death that occurred was that of a native. The country traversed was very mountainous, and no table-land was discovered. Of the geological formation the country is mainly decomposed slate, granite, and quartz, with no sign of gold. Specimens of rock were collected by the Governor. The climate to 8000 feet is moist, above that dry and bracing. Natives were met on only two occasions, and were extremely friendly. They were stout well-built men, but no women were ever seen. Cultivation paddocks were fenced in. Potatoes, yams, and sugar-cane were plentiful, as also was tobacco. Natives, who were devoid of warlike implements, paid particular attention to head-dresses made of shells procured from the natives on the eastern coast of German New Guinea, who were showing friendly communication. Across the Owen Stanley Range the Governor collected many specimens of new plants, among others being some beautiful yellow rhododendrons, which he has since sent to Melbourne to Baron Von Mueller for report. A great number of new grasses in large patches were discovered. At Mount Victoria (Goodwin) he secured several new birds and one animal, which was something like a native bear, but had a long tail and dusty-brown collar and black extremities. The extreme length was 3 feet 6 inches, of which the tail was 1 foot 6 inches. There were five claws on all the feet, the tail was bushy, and it was estimated that the weight of the animal was 40 pounds. The birds of the lower altitudes were the same as those before seen, except as to a new paradise bird similar to the Great Epimachus. Sir William procured a female *Astrachia stephania*, the only male bird of that species being in the Museum, Berlin. The Governor procured several new small birds at Mount Victoria, including the identical English lark. Unfortunately, they were eaten by the Polynesians. Entomological specimens were obtained, including a milk butterfly. Only a few were captured.

ACCORDING to a *Times* telegram from Zanzibar, the Sultan has signed a concession to the British East Africa Company, of Lamu and the Ben-Adir coast, embracing all his territory from Kipini to Mruti. The concession embraces the administration and government of the island and port of Lamu, and of the northern mainland ports of Kismayu, Brava, Magadisho, and Warsheikh. The company's jurisdiction is thereby extended from the River Umba, in the south, to the port of Warsheikh in the north, an extent of about 700 miles of coast-line. Lamu is, next to Zanzibar and Mombasa, the most important port on the East African coast, and commands the trade of the mainland south of Kismayu, and that of the fine waterway of the Tana. It has been for years past the seat of a flourishing commerce, which is mostly in the hands of British Indian subjects, and it is a port of call for the British India Company's steamers.

OUR SENSATIONS OF MOTION.[1]

WE may distinguish two quite different kinds of sensation of motion, active and passive. When we walk or run or row, we use our muscles, and this use of our muscles is the cause of our motion, and also the cause of special sensations which may in a sense be called active sensations of motion. But we have other sensations than these connected with motion. For, if we are carried, or rocked in a boat, or dropped from a height, we are not only moved, but we are conscious of a very well marked sensation which we may call a passive sensation of motion. When we move ourselves we feel both kinds, and it is difficult for us to analyze what we feel and distinguish between our sensations as movers and our sensations as moved. It is to our passive sensations of motion that I wish to direct your attention to-night, and as these can best be examined in cases where they are not complicated with the other kind, we shall confine our attention almost exclusively to passive motion—that is, to cases where we are moved without any exertion of our own muscles. Now the first thing I have to say is in at all events apparent contradiction to the title of this lecture: it is that we have no direct sensation of motion as such. That this is so will be at once obvious if we consider the fact known to all, that we are at this moment being moved with very great velocity through space. We know that this is so, astronomers can prove it, but we are so perfectly unconscious of it that I dare say most of us here could not point the direction in which we are moving; in fact, as we are ignorant of the direction and rate of motion of the great system of which our solar system is a part, no one can say how fast and towards what point in space we are travelling. What we are conscious of is change of motion. It is because the motion of the earth is so steady, because, although very rapid, its changes are very slow, that we do not feel it.

There are two altogether different ways in which a body can be moved. These have been called respectively translatory and rotational. In translatory motion the body is always similarly oriented. Thus, if we consider motion within so small a part of the earth's surface that we may neglect the earth's curvature, such an object as this desk is subjected to purely translatory motion if we move it thus, so that the same side always looks up, and the same side always looks east. Rotational motion involves a change of orientation, and is rotation about an axis. This axis may always be the same, or it may change, and the change of axis may be abrupt or may be continuous. Most of the motions which we observe are made up of both kinds. When we travel by rail—always supposing that we sit still in the carriage—we are subjected to a purely translatory motion only when the train is running along a perfectly straight piece of the line. When it goes round a curve, we are—always supposing we sit still—subjected to rotation as well as to translation; because our face no longer continues to look in the same direction, but, as long as the train is running on the curve, continuously changes the direction in which it looks.

Let us examine what we feel when we are passively subjected to purely translatory motion. As long as the motion is steady,

[1] Armitstead Lecture delivered in Dundee, by Prof. A. Crum Brown.