

OUR ASTRONOMICAL COLUMN

THE TRANSIT OF MERCURY, MAY 5-6, 1878.—An Appendix to the "Washington Observations, 1876," is devoted to reports on telescopic observations of this transit and discussions of them. There are individual reports from Professors Asaph Hall, Harkness, Eastman, and Holden, and from Dr. Henry Draper and Mr. H. M. Paul. Probably no other phenomenon of the kind has been watched by so large a number of observers, 109 names appearing in the general record. They were, with very few exceptions, stationed at different points in United States territory. The observations have been calculated by Prof. Eastman and Mr. Paul: the former, attaching greater weight to a certain number made by more experienced observers, finds for the Washington geocentric times those given in the second column below; Mr. Paul deduces for the most probable values those given in the third column (the time of first external contact depending on only two or three observations being omitted; the other contacts depend on 57, 52, and 8 observations respectively):—

	EASTMAN.			PAUL.		
	h.	m.	s.	h.	m.	s.
First external contact	22	4	42.0	22	7	42.1
First internal "	22	7	42.1	22	7	42.1
Second internal "	5	35	27.8	5	35	28.3
Second external "	5	38	25.7	5	38	29.52

If the first series of times are compared with the figures in the *American Ephemeris*, which depend upon the earlier theory of Mercury of Leverrier, the errors of prediction are respectively + 77s., + 84s., + 110s., and + 119s. These differences are greatly diminished if the times are compared with those resulting from Leverrier's later theory involved in the tables in the *Paris Annales*, vol. v., as used in the *Nautical Almanac*, more especially if the solar semi-diameter employed is diminished by 2".0, so as to make the results more strictly comparable with those of the *American Ephemeris*: we have then for the errors of computation, + 2s., + 9s., + 25s., + 34s. The superiority of the later theory is thus evident, and it will be remembered that this theory involves the increased motion of the perihelion of mercury, which induced Leverrier to suspect the existence of one or more planetary bodies, or of matter in some form between Mercury and the Sun.

We may add that if the positions of the planet in the *Nautical Almanac* are combined with the semi-diameters of sun and planet inferred by Leverrier from the transits, the computed times of the internal contacts exhibit differences of + 19.8s. and + 16.4s., the first agreeing closely with the corresponding one deduced from observations in Europe.

THE SECOND COMET OF 1880 (SCHABERLE, APRIL 6).—On the evening of May 8 this comet passed nearly over a star of the eighth magnitude, No. 6815-6 of Oeltzen's Argelander (= 901 of Fedorenko), and Major Tupman, R.M.A., availed himself of this somewhat unusual opportunity for fixing the place of a comet with great precision. By twenty comparisons, ten before and ten after the conjunction in declination, it was found that at 10h. 16m. 17s. Greenwich mean time, the comet followed the star 2".80s. and was 2".2 south of it.

The following ephemeris, for Greenwich midnight, is derived from elements which represent the observations pretty accurately up to May 8:—

	Right Ascension.			Declination.	Log. distance from the Sun.	
	h.	m.	s.		Earth.	Sun.
May 20	6	22	53	+56 43'7"	0.38965	0.27695
22	6	23	57	55 49.4		
24	6	25	3	54 56.6	0.39725	0.27379
26	6	26	10	54 5.2		
28	6	27	17	53 15.1	0.40432	0.27090
30	6	28	24	52 26.4		
June 1	6	29	32	+51 38.8	0.41084	0.26829

It appears not improbable that this comet may be observed until towards the end of the year, arriving at its least distance from the earth early in November, and at the same time attaining its greatest intensity of light. It will be lost from proximity to the sun's place for several weeks about the perihelion passage, which is likely to occur about July 1, becoming visible again at the beginning of August in the morning sky. The orbit upon which the above places are calculated gives for the position on August 5 at 12h. G.M.T., right ascension 6h. 58.7m., declination +

31° 52'. The intensity of light on May 8 was about one-third less than is assigned for the first week in November.

PROF. C. A. F. PETERS.—We regret to have to record the death of Prof. Christian August Friedrich Peters, formerly of the Russian Central Observatory at Pulkowa, subsequently Professor of Astronomy in the University of Königsberg, and Director of the Royal Observatory at Kiel, and for upwards of twenty-five years editor of the *Astronomische Nachrichten*. After a long illness he died on the 8th of the present month, in his seventy-fourth year. We reserve a notice of Prof. Peters' principal astronomical work until next week.

GEOGRAPHICAL NOTES

BEFORE starting on his journey from Lake Nyanza to Lake Tanganyika, which we have previously referred to, Mr. J. Stewart, of Livingstonia, spent some time in examining the country on the west of the upper portion of the former lake. He started from Kaningina, and crossed the mountain of the same name at an elevation of about 5,000 feet. After a visit to Chipatula's village he entered Mombera's territory in the Kasitu Valley, and shortly reached the junction of the Kasitu with the Rikuru, which comes from the west through a wild and mountainous country. The valley of the Rikuru north of the junction is called Ntanta, and is exceedingly fertile; the elevation is about 3,700 feet, and the climate is cool and pleasant. Here Mr. Stewart noticed an important change in the geological formation, the granite and quartz giving place to soft shale and clay schists; and he is of opinion that the Kasitu forms the geological boundary, and that it runs in the trough of some great fault or nonconformity in the formation. Ten miles further north regularly stratified beds of hard, dark grey sandstone were met with. The Rikuru Valley, which Mr. Stewart thought would have taken him gradually down to the lake-level, is at its north end blocked by hills forming the lake coast, and the river flows through winding precipitous valleys, falling 2,000 feet in the last fifteen miles. The water enters the gorge clear and sparkling, and leaves it heavily laden with bluish clay silt, which is visible far into the lake. Mr. Stewart reached the lake at the mouth of this river in S. lat. 10° 45' 15". Marching northwards, he visited Mount Waller, which he examined thoroughly, and then, after keeping inland for four days, arrived at the Kambwe lagoon, his starting-point for Lake Tanganyika. The country from Mount Waller to this place is very poor, consisting of swamp and hard clay plain, broken here and there by dry gravel ridges, and occupied chiefly by large game.

THE International African Association have just issued the third part of their periodical publication, which contains extracts from the reports of their travellers in East Africa. M. Cambier gives an account of recent earthquakes on Lake Tanganyika and some details of the work at the station at Karema, the position of which he has fixed as in S. lat. 6° 47' 50". M. Popelin narrates the particulars of his journey from Tabora to Karema, and some of the plans for the future. There are also other letters from them, as well as from Mr. Carter and M. van den Heuvel and a medical report by Dr. Dutrieux. M. Burdo, the leader of the third expedition, announces his arrival at Mpwapwa on February 18, and sends a report on the route followed from Saadani. His caravan consists of 108 persons and fourteen asses.

THE German branch of the International African Society intends establishing the first German station at the southern extremity of Lake Tanganyika. The expedition, in which Capt. Schöller, the well-known zoologist, Herr Boehm, and Dr. Kaiser take part, has already left Berlin. Dr. Nachtigal made several communications on the subject at the last meeting of the Berlin Geographical Society.

NEWS has been received concerning the expedition of Dr. Mook and Herr von Holzhausen to the Pettit and Atbara rivers. The travellers left Kassala on January 9, and reached Tomat on the 16th, after crossing the Pettit and the Atbara. Tomat is the winter camp of the Sheikh of Dabanya bedouins. Here they were detained for eight days. Then they proceeded along the left bank of the Atbara as far as the mouth of the Bacher Salam River, but were then compelled to return on account of the absolute uncertainty of the country, and the indisposition of Herr von Holzhausen. The country near the Bacher Salam is completely deserted on account of hordes of Abyssinian brigands.

The travellers were robbed, and owe their lives simply to forced night-marches, gun in hand. They reached Kassala on February 12. Dr. Mook gives a sad account of the deplorable condition of the Soudan, where, as it seems, complete anarchy prevails.

THE United States Government is fitting out an expedition at San Francisco to search for the Arctic exploring vessel *Jeannette*, which has now been some months out. The revenue cutter *Corwin* has been selected for the duty, and she will start with one year's provisions. Her instructions are to search for two missing whalers also. The *Jeannette* went by what is called the eastern passage by Behring's Straits, and Capt. Markham, formerly of Her Majesty's ship *Alert*, of Polar fame, suggested that every year during the *Jeannette's* absence a vessel like the *Corwin* should be sent into the Arctic regions to save her or to learn, as the case may be, of her progress.

AN Austrian expedition, under the guidance of Dr. Otto Benndorf, Professor of Classical Archæology at the Vienna University, is about to start for Olympia. Besides Dr. Benndorf, Prof. E. Petersen (Prague), Dr. W. Gurlitt (Graz), some other member of the Vienna University, and an architect, will take part in the expedition. Dr. Wilhelm Klein, who has already started for Greece, will meet the expedition at Olympia. Another authority in archæology, Prof. Ernst Curtius, has also started for Olympia.

THE Dutch ship *Willem Barends* is being equipped for a third North Polar Expedition.

HERR ROBERT VON SCHLAGINTWEIT, the well-known traveller, has arrived at New York, whence he will proceed to Washington. He then intends to go on a scientific tour to the West of North America.

THE first sheet of a large prehistoric map of Bavaria, by Prof. H. Ohlenschlager, has recently been published. It comprises the district where, in the present day, Munich, Rosenheim, and Kempten are situated. The whole map will consist of fifteen sheets.

NO. 4 of Band xxiii. of the *Mittheilungen* of the Vienna Geographical Society contains the first part of an account of a botanical excursion to the Kasbeck (Caucasus) in the summer of 1871, by Peter Murontzoff. At the monthly meeting of the Society, on April 27, a letter was read from Dr. Oskar Lenz from Tarudent, describing his passage of the Moroccan Atlas, in which he gives some interesting observations on the mountains and the people. Another letter was from Lieut. Kreitner, who accompanied Count Széchenyi in his attempt to penetrate Tibet through China. Lieut. Kreitner states that he plotted carefully the whole route of the party and took many observations, while his companion, Herr von Loegy, took as careful note of the geological features of the region traversed.

*L'Exploration* for May 13 has the second of a series of articles on Central Japan, Yeddo being the subject of the present instalment; there is also a translation of Lieut. Bove's project of Antarctic exploration, the main points of which we have already given; the number also contains reports of the geographical societies of Quebec and the Argentine Republic, and numerous notes and news, the sources of which, we regret to see, are seldom acknowledged, their value thereby being much decreased. Under the editorship of M. Tournafond this journal is improving, though we think there is still much to be done ere it can be regarded as occupying a first place among geographical journals.

DR. HOLUB, the well-known African traveller, has opened an interesting exhibition at Vienna, which contains thousands of objects brought by him from the South African tribes. They are arranged in various groups, and are classified as zoological, botanical, mineralogical, archæological, ethnographical, and commercial objects.

### THE PARALLEL ROADS OF LOCHABER—THE PROBLEM AND ITS VARIOUS SOLUTIONS<sup>1</sup>

AT a recent meeting of the Inverness Scientific Society and Field Club, and again at Fort William, in the immediate neighbourhood of the phenomena, a lecture was given on the above subject by Mr. William Jolly, H.M. Inspector of Schools, who has, for more than ten years, devoted great attention to the

<sup>1</sup> By William Jolly, F.R.S.E., H.M. Inspector of Schools, Inverness.

subject, and will shortly publish the results of his investigations.

Mr. Jolly thought the subject peculiarly appropriate for their Society, both on account of its intrinsic interest and the eminent men who had written of it, and the proximity of the Club to the locality exhibiting these singular and attractive phenomena. His aim was to state the problem, to explain the solutions offered, give its bibliography, criticise the theories, and develop more fully the one he adopted. He first described the locality of the roads in Glen Roy, Glen Spean, Glen Gluoy, and Glen Laggan, all at the south end of the Great Glen; and their unique and striking aspect, such as to draw the attention of the primitive Celts. They had received several names, being known in Gaelic as *Na Casan*, literally the feet, hence footpaths, of which *Parallel Roads* was a literal translation. Campbell of Islay's rendering, "The Bends," the Rev. Mr. McGregor, of Inverness, the Gaelic scholar, thought fanciful, and without foundation. They were also variously called "lines," "shelves," &c. The highest recognised is in Glen Gluoy at 1,172 feet, another existing there at 964; the three chief in Glen Roy stand at 1,148, 1,067, and 855; the lowest sweeping round into Glen Spean at the same level. A possible road, discovered by Darwin in 1838, in Glen Laggan, above the Loch Laggan Locks, is 1,300 feet high. Their breadth varies from 40 to 70 feet, giving an average of 60. They slope towards the valley at an angle of from 5 deg. to 30 deg., the hill face being inclined from 25 deg. to 40 deg.

Mr. Jolly then, by means of a printed diagram, which enhanced the clearness of the exposition, explained the Conditions of the problem, all of which must be satisfied by any theory claiming to be the true solution. These conditions were the following:—

#### I.—THE CONDITIONS OF THE PROBLEM

##### I.—*The Peculiar Form and Character of the Roads*

1. Their general horizontality and parallelism.
2. Their general equality of width (*a*) in the course of the same line, and (*b*) in relation to each other.
3. Their general continuity.
4. Their stair-like form, as of parallel layers laid successively on each other on the hill-side.
5. Their sloping towards the valley.
6. Their being proportionately narrower where they are steeper.
7. Their general absence where solid rock protrudes, and where the slope is exceptionally flat.
8. The *débris* of the hill above and below the Roads sloping more or less at the angle of repose.

##### II.—*Their Composition*

9. The absence of rounded, water-worn stones along them, and the general greater or less angularity of these.
10. Their consisting of the same *débris* as the rest of the hill-face, and not of transported matter.
11. The absence of cliffs, caves, and rock-notching, or any deep erosion, along their course.

##### III.—*Their Distribution*

12. Their sudden endings in all cases, without greater accumulations of *débris* or other indications of the cause of the same.
13. The symmetrical disappearance of the same lines at points opposite each other, in the same and contiguous valleys.
14. The outward extension of the roads, according to their lesser altitude.
15. Their occasional disappearance for considerable distances.
16. Their different altitudes in different glens, and the absence of the same lines in neighbouring glens.
17. Their being confined to Glen Roy and neighbourhood.

##### IV.—*Their Relations*

18. The existence of cols in connection with and slightly lower than each of the main roads.
19. The existence of other lines of a different character, above and below the roads. (Dwelt much on by Chambers.)
20. The existence of much terraced *débris*, below the roads, in the bottoms of the valleys containing them.
21. The relation of the roads to the glaciation of the district and its remains.

#### II.—THE SOLUTIONS OF THE PROBLEM

Mr. Jolly then expounded, by means of another diagram, the various theories proposed to satisfy these Conditions, and account for the Roads, naming the writers advocating them, with their