months after rain. Leaving the well on October 5, the return journey was commenced in a north-easterly direction to the Field river, two elevations on its western side being respectively named Mounts Knuckey and Dobbie, and some further explorations were made in the Adam Ranges among the creeks at its head, where Mr. Winnecke "disturbed a wild cat of an extraordinary size, nearly as large as a leopard" (presumably a *Dasyurus*). Sandringham station was once more reached by a south-easterly cut across the boundary line, and after crossing the Herbert and Mueller or Diamantina rivers (the latter a clay watercourse six miles wide, overgrown with *Polygonum*), the party arrived at Farina Station on December 1, and travelled from Beltana to Adelaide by rail.

Mr. Winnecke appears to have paid considerable attention to the botany of the region traversed, the productions of which, as being the central point of the Australian continent, are of exceptional interest. Baron F. von Mueller adds a list of 85 plants collected, several of which are entirely new either as species or varieties, or afford structural peculiarities.

Hydrographical Observations of the Nordenskiöld Expedition to Greenland, 1883.

By Axel Hamberg.

[Communicated by Baron Nordenskiöld.]

I.

In order to carry out the observations of which I give an account in this paper, the expedition was provided with an excellent selection of apparatus and instruments. Observations of the temperature of the sea at great depths were made both with Miller-Casella and Negretti-Zambra thermometers, and for the latter we had at our disposal an apparatus which possessed several novel advantages. Samples of water were taken from greater depths by means of the water-bottle constructed by F. L. Ekman, while the specific weight of the sea-water was determined with carefully adjusted areometers, on the scale of which was marked the fourth decimal of the figure indicating the specific gravity. It was possible, at all events, to discern with certainty two fractions of the fifth decimal. As the areometer, however, always gives unsatisfactory results, as compared with the volumetric analysis with nitrate of silver (titration), the chlorine was also tested. With regard to the accuracy of these determinations 0·05 per cent. of the quantity obtained may be taken as the average difference between two carefully effected analyses.

In consequence of the peculiar differences in temperature found in some places, it became of great interest to ascertain the specific gravity of the various horizontal layers of water at their own temperature: as, however, the areometer in most instances does not give exact indications on this point, I have in various waters, whose saltness lies between 2·576 and 3·526 per cent., determined accurately the

proportion between the specific gravity and the amount of chlorine, by the aid of Sprengel's pycnometer, and from this calculated the following simple formula :—

Sp. gr. $\frac{0°}{4°}$ = 1 + Cl. (0·00147—0·000003 Cl.). Sp. gr. $\frac{0°}{4°}$ is, according to Ekman's method of designation,* equal the specific gravity at 0°, in proportion to pure water of + 4° as standard. Cl. = gramme chlorine per litre at 0°.

The densities quoted in the following are, by the aid of this formula, calculated from the amount of chlorine, and then reduced to $t°$, i. e. the temperature *in situ*.

II.

Denmark Sound, between Iceland and Greenland, is from a hydrographical point of view very interesting. Currents of distinctly different nature are here represented within an unusually limited area. The warm current, the so-called Irminger current, which washes the western and northern shores of Iceland, has been fairly well studied as regards its temperature by the Danish Admiralty expedition in the *Fylla*, 1877–78.† The cold polar current of East Greenland has, however, previous to the Nordenskiöld expedition of last year, on account of the difficulty of approach, been comparatively little studied by scientists. The observations made have thus been confined to the edge of the current, on the borders of the warm current. Captain Mourier,‡ who, in 1879, continued the Danish researches in Denmark Sound in the *Ingolf*, observed during his journey along the polar current always a comparatively high temperature of the bottom, from which discovery he drew the conclusion that this current flows on a layer of comparatively warm water, when it has passed the bottom threshold between Iceland and Greenland. This statement cannot certainly be reconciled with Hoffmeyer's discussions of the *Fylla* expedition's observations in 1877 by the edge of the ice; but that Mourier was right in his assumption the Nordenskiöld expedition of last year has fully demonstrated by the series of important observations made in the very heart of the polar current.

On the basis of the researches of the above-mentioned expedition the following peculiarities of the polar current of East Greenland and adjacent warm seas have been demonstrated.

1. The cold polar current of East Greenland flows, throughout its whole course between 66° lat. N. and Cape Farewell, on warm water. If the faint, sometimes casual warming of the upper layers be not taken into account, a temperature, which increases with the depth, reigns in the polar current and underlying water layers, which the following table will show:—

Lat. N.		Long. W.									
				Depth in metres	0	50	100	150	200	400	700
°	′	°	′		°	°	°	°	°	°	°
59	43	43	16	Temperature in Celsius	+ 0·1	0·0	0·0	+ 1	+ 3		
63	10	40	35		− 0·8	..	− 0·7	..	..	+ 0·2	+ 4
66	18	34	50		− 0·7	− 1·5	− 0·7	+ 1·5	+ 3·1		

* 'Kongl. Sv. Vetensk-Akad. Handl.,' ix., No. 4, p. 6.

† 'Ann. d. Hydr.,' 1880, pp. 173–192.

‡ 'Geografisk Tidskrift' (R. Danish Geo. Society), iv., 1880, p. 47.

2. The depth of the polar current seems to depend on the depth of the sea. If 0° be taken as the limit of the polar water, we obtain the following values of the depths:—

Depth to the Bottom in Metres.	Depth of the Polar Current in Metres.	Lat. N.	Long. W.
		° ′	° ′
90	82	65 33	37 32
215	100	59 43	43 16
255	120 (approx.)	66 18	34 50
750	350 (approx.)	63 10	40 35

Among these observations none has been used which would give a too small depth, by belonging to the eastern border of the polar current, where the depth of the cold water may be very small.

3. In the warm Atlantic Ocean, outside the polar current, a temperature which decreases with the depth naturally prevails. This circumstance corresponds with the division of the temperature in the polar current thus, that on the borders between the warm and the cold water a temperature prevails which in the upper layers increases and in the lower ones decreases with the depth, as the following table shows:—

Lat. N.	Long. W.									
		Depth in metres	0	25	50	100	150	200	250	450
° ′	° ′		°	°	°	°	°	°	°	°
62 35	40 41	Temperature in Celsius	+ 2·2	+ 3·9	+ 5·1	+ 5·7	..	+ 5·7	..	+5·1
65 25	37 15		+ 4·7	..	+ 5·5	..	+ 5·4	..	+5·2	

4. Hoffmeyer has already indicated that the surface water of the cold current is less salt than that of the warm Irminger current. This relation between coldness and saltness is very nearly proportional—at all events within certain limits—so that a higher temperature always bespeaks greater saltness.

During the return journey of the expedition, in August and September, alongside the polar current, the following observations of average saltness under the temperature indicated were obtained:—

Average Saltness Per Cent.	Mean Temperature in Celsius.	Number of Observations.
	°	
3·0545	− 0 18	8
3·3045	+ 3·00	2
3·4255	+ 4·55	2
3·4910	+ 7·83	3

5. The saltness of the polar current (between 67° and 59° lat. N.) seems during the summer to be lowest in the northern and highest in the southern parts. The average figures obtained were:—

Lat. N.	Per Cent. Salt.	Temperature.
° °		°
59 and 60	3·164	+ 0·4
62 and 63	3·066	− 0·2
65 and 66	2·937	− 0·5

6. The saltness of the polar current varies probably greatly according to the seasons, and seems to be higher in the spring than autumn.

7. In the East Greenland polar current a saltness prevails which increases rapidly with the depth, as the following series will show:—

Lat. N.	Long. W.				
° ′	° ′	Depth in metres	0	100	200
59 43	43 16	Temperature in Celsius	+ 0°·1	0°·0	+ 3°
		Per cent. of salt	3·223	3·345	3·414

8. In the Irminger current, on the contrary, the conditions seem almost to agree with those found by Buchanan in the southern parts of the North Atlantic.*

In 65° 17′ lat. N. and 30° 30′ long. W., I have, from the average of two series of researches with chlorine, fairly corresponding with each other, found a saltness which increases very gradually in the upper layers, but which slowly decreases in the lower ones.

Depth in metres ..	0	100	500	1000	2025
Temp. in Celsius ..	+ 8°·6	+ 7°·2	+ 5°·6	+ 4°·4	+ 1°·2
Per cent. of salt ..	3·5225	3·5260	3·5225	3·5215	3·5100

9. In spite of the circumstance that the temperature of the polar current increases with the depth, and the saltness of the Irminger current decreases with the depth, the increase of temperature in the one case and the decrease of saltness in the other are sufficient to create in both currents a specific gravity which gradually increases with the depth (at the temperature *in situ*), which is shown by the following tables:—

THE POLAR CURRENT.

Lat. N.	Long. W.				
° ′	° ′	Depth in metres ..	0	100	200
59 43	43 16	Temp. in Celsius ..	+ 0°·1	0°·0	+ 3°
		Per cent. of salt ..	3·223	3·345	3·414
		Sp. gr. $\frac{t^\circ}{4^\circ}$	1·02585	1·02683	1·02715

THE IRMINGER CURRENT.

Lat. N.	Long. W.						
° ′	° ″	Depth in metres ..	0	100	500	1000	2025
65 17	30 30	Temp. in Celsius	+ 8°·6	+ 7°·2	+ 5°·6	+ 4°·4	+ 1°·2
		Per cent. of salt ..	3·5225	3·5260	3·5225	3·5215	3·5100
		Sp. gr. $\frac{t^\circ}{4^\circ}$	1·02734	1·02756	1·02774	1·02786	1·02805

* 'Proc. R. G. S.,' 1877, p. 72.

10. The specific gravity at the temperature *in situ* is at the same depth less *in* the polar current than *outside* it. The cold East Greenland current, therefore, flows over a compact current of warm water from the Atlantic Ocean.

In consequence of the considerably lower specific gravity of the cold current, the warm and heavy one supports and lifts the polar water. The rising may in the southern part during the autumn (according to observations in 59° 43′ lat. N. and 43° 16′ long. W.) be estimated at 0·15 metre. But as the water in the polar current seems (*vide ante*, II. 5) to be less saline in its northern than southern parts, the former must lie higher still, and the East Greenland current, therefore, be flowing down an incline, tending southwards, due allowance being, of course, made for slight divergences and the attraction of *terra firma*. The lesser the saltness, the greater the incline should be, as well as the speed of the current, and, consequently, the variations of the speed of the current should correspond with the variations of the saltness (*ante*, II. 6).

The ice-masses which cause the polar current do not seem at any period of the year to spread so that the coast becomes free from ice, but their width is most probably affected by certain more or less regular variations, dependent on the seasons, a circumstance which it would be of great interest to ascertain, as it is closely connected with the question—At what season is the ice-belt on the south-east coast of Greenland easiest to penetrate?

The following particulars may contribute to solve this question:—

1. Several reports indicate that the ice-masses on the east coast diminish during the spring and summer. This is particularly demonstrated by a chart published by Dorst,* on which the retrogression of the ice-belt during the period March–August is apparent at a glance.

2. The observations of the ice made by the Nordenskiöld expedition last year prove that the quantity of ice in the polar current (between 60° and 66° lat. N.) was far greater in the middle of June than in the beginning of September.

3. Th. Thoroddsen's exhaustive exposition of the conditions of the ice around Iceland† shows that the drift-ice appears here often as early as January, and lasts until the autumn. During September, October, November, and December, however, there is, generally, very little ice.

4. According to the numerous observations by the Danish settlers and navigators on the south coast of Greenland, the polar ice always appears there in May, June, and July, whereas in November, December, January, and February there is no ice.

To all these variations with the seasons there are, of course, exceptions, while the quantity of ice is not the same in any two years. Nevertheless we may assume, supported by the above, that the polar current already in January and February begins to swell in its northernmost parts, attaining its maximum during the spring months, and to diminish in force during the summer, being during the autumn and winter comparatively insignificant. But, of course, all these changes occur later in the southern than the northern parts of the current.

The expeditions which have attempted to reach the east coast of Greenland generally have, as far as I am aware, entered upon the undertaking in the very height of the summer—in June, July, and the first half of August—and have all failed. Nordenskiöld, however, chose September, a far more suitable season—and succeeded. Maybe an attempt during October or November would be more successful still?

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* 'Peterm. Mitth.,' xxiii., 1877, p. 174, Tab. 10.

† 'Ymer' (R. Swedish Geo. Society), 1884, p. 145.

III.

Petermann assumed * that a warm current ran along the west coast of Greenland, extending far north, even to Melville Bay, Smith Sound, Jones Sound, and Lancaster Sound, making these waters navigable at certain periods of the season. Bessels, of the *Polaris* expedition, maintains † that Petermann's assumption is formed without knowledge of facts. He asserts that no trace of a warm current is felt beyond 75° lat. N., and seems almost inclined to disbelieve altogether the existence of this arm of the Gulf Stream.

The temperatures found in the sea on the west coast of Greenland by the Nordenskiöld expedition were generally low, even below 0°. At greater depths, very low temperatures were always found, while the saltness was comparatively small. The following series of observations may serve as an example :—

Lat. N.	Long. W.	Depth in Metres.	Temperature in Celsius.	Per Cent. Salt.
° ′	° ′	°	°	
61 15	49 11	0	+ 0·8	3·136
,,	,,	100	+ 0·5	3·366
,,	,,	125	0·0	
65 15	53 30	0	+ 1·5	3·352
,,	,,	75	+ 1·1	3·361
,,	,,	125	+ 0·2	3·368
70 29	55 40	0	+ 4·4	3·309
,,	,,	40	+ 1	
,,	,,	90	− 0·2	3·374

These figures do not seem to confirm Petermann's theory as to a warm current along the west coast of Greenland, and, still, he may be in some measure right.

Carpenter has demonstrated ‡ the presence of extensive layers of comparatively warm water in those parts of Davis Sound which are far from the Greenland coast, even in 63° lat. N., and what is more natural than that the American polar current —the existence of which is a fact—should create a counter current in the eastern parts of the sharply defined bay, the bottom of which is called Baffin Bay?

It is now thirty years since Irminger demonstrated § that the East Greenland polar current, on having reached Cape Farewell, continues to flow along the coast westwards and northwards. That the polar current, or, perhaps, more correctly, the polar ice thus changes its original course seems to me to indicate that an arm of the Gulf Stream really flows into Davis Sound. But, during the greater part of the year, this arm has nothing but the direction in common with the Petermann current. Its temperature may be very different.

If therefore, as Petermann believed, an arm of the Gulf Stream flows towards Davis Sound, it strikes the polar current of East Greenland at Cape Farewell, and carries a great deal of drift-ice from the same westwards and northwards, which reduces the temperature and the saltness to such an extent that the current assumes the character of a cold stream. These effects of the polar current are most apparent on the south-west coast, while further north the conditions become equalised with

* 'Peterm. Mitth.,' 1867, p. 184, and 1870, p. 220.

† 'Scientific Results,' &c., vol. i., Phys. observ., p. 13, by E. Bessels. Washington, 1876.

‡ 'Proc. of the Royal Society,' vol. xxv. p. 230.

§ 'Nyt Archiv for Sövesenet' (Copenhagen), ix., No. 4.

those at a greater distance from the shore. This is fully proved by our observations of the saltness of the sea along the west coast in August last..

Lat. N.	Per Cent. Salt.	Number of Observations.
° °		
From 60 to 63	3·1328	4
„ 63 „ 65	3·2027	3
„ 65 „ 67	3·2920	2
„ 67 „ 68	3·3250	2
„ 68 „ 71	3·2970	2
„ 71 „ 73	3·2320	3

It seems, therefore, that the sea-water was, at all events on this occasion, poor in salt in the vicinity of the polar current, and richer the further away we got from it. The saltness seemed to have attained its maximum at about 67°–68° lat. N., whence it again decreases northward and in the recesses of Baffin Bay.

If we may assume that the East Greenland polar current affects the temperature and saltness in the manner I have indicated, the changes which the polar current suffers at the various seasons should cause corresponding ones on the west coast. Thus, when the polar current during the spring and summer carries to South Greenland large quantities of ice, the latter would make the warm and concentrated water of Davis Sound thinner and colder. But if, on the other hand, the polar current shrinks during autumn and winter, and no drift-ice appears on the south coast of Greenland, the arm of the Gulf Stream assumed by Petermann ought to have full sway. During the late autumn and winter, therefore, warmer and salter water should be found along the west coast of Greenland.

IV.

In several fjords, as, for instance, those of Julianehaab, Arsuk, and Waigat, the expedition found a remarkable division of temperature, which has previously been observed in Arctic and Antarctic regions. It consists in the presence of a layer of cold water between two comparatively warm ones, of which one lies at the surface and the other at the bottom. As an example of the variation in the temperature, the following table may serve :—

60° 42′ l. N. 46° 0′ 20″ l. W., at Julianehaab	Depth in metres	0	5	15	30	75	125	225	
	Temp. in Celsius	+9°·2	+3°·3	0°·0	−0°·2	−0°·5	−0°·3	+0°·6	
In the middle of Arsukfjord off Ivigtut	Depth in metres	0	10	25	50	75	150	300	560
	Temp. in Celsius	+7°·3	+2°·0	+1°·0	+0°·1	0°·0	−0°·4	+1°·4	+1°·8
69° 51′ l. N. 51° 37′ l. W. (Waigat)	Depth in metres	0	75	165	360	550	640 (?)		
	Temp. in Celsius	+5°·0	−0°·3	−0°·8	+0°·9	+1° 3	+1°·5		

Thus, from a maximum at the surface the temperature falls rapidly at first, then slowly, to a minimum in an intermediary depth, again to rise, first quickly, then slowly, towards the bottom to a secondary maximum. The increasing saltness

towards the bottom is more than sufficient, in spite of the changes in the temperature, to cause a specific gravity which constantly increases with the depth (with the temperature *in situ*), as the following table shows:—

In the middle of Arsukfjord off Ivigtut ..	Depth in metres ..	0	75	150	300	550
	Temp. in Celsius ..	+7°·3	0°·0	−0°·4	+1°·4	+1°·7
	Per cent. salt ..	1·910	3·284	3·322	3·401	3·411
	Sp. gr. $\frac{t^\circ}{4^\circ}$	1·01500	1·02635	1·02663	1·02718	1·02723

One of these fjords, Arsukfjord, was the object of a somewhat exhaustive study, but I do not think that a great many details about these small, although interesting, basins will be of general interest enough to be treated here.

With regard to the cause of this remarkable division of temperature, Mohn has advanced a satisfactory explanation,* as far as the Norway fjords are concerned—where similar conditions prevail—viz. that the surface maximum is caused by the heat of the summer, the minimum by the cold of the winter, and the lowest maximum by the remaining effects of the previous summer. But the Greenland fjords are in many respects different from those of Norway, and one great factor must also not be forgotten—the inland ice.

In many fjords the inland ice acts directly by their glaciers, in all of them through icebergs, and these actions are continued all the year round. It is evident that these enormous ice-masses, which are frequent and some hundred metres in depth, must greatly affect narrow and confined basins, and it is impossible that any such high temperature as that registered in the Arsukfjord and the Waigat could penetrate to the bottom. (Comp. the series below by M. Hammer.)

That the warm temperature on the surface is due to the sun, as Mohn maintains, is of course only natural.

The low temperature of the middle, cold layers is probably caused by the inland ice and the winter cold, and the lowest warm one can only retain its heat by the connection of the fjord with the sea. The fjords are certainly to some extent barred by elevated thresholds at the bottom, but these cannot possibly prevent the outflowing fjord currents from creating reactive currents from the sea, or that the latter at every tide flow into the fjord, where the greater weight of the sea-water causes it to form the lowest layers. According to what has been previously stated relating to the conditions of the sea along the west coast of Greenland, it seems that it is in the winter chiefly that the lowest warm layers of the fjords receive their heat and saltness.

Taken in conjunction with the conditions found by me in the summer, Hammer's serial temperatures registered early in the winter on the Jakobshavn ice fjord may be explained.† I append some of them.

No.	Depth in fathoms	0	5	10	20	30	40	60	70	80	100	110	140	159	163	209
1	Temperature in Celsius	0°·0	..	+1°·3	+1°·9	..	+2°·0	..	..	+0°·7	..	+1°·0	..	..	+2°·0	..
2		−2·2	−1·2	−0·9	−0·4	−0·3	..	0·0	..	..	+0·7	..	+0·7			
3		−2·4	−1·0	−0·7	−0·7	−0·3	+1·0	..	+0·3	..	..	+0·4	..	+0·5	..	+0·9

* 'Peterm. Mitth.,' Ergänz., H. 63, p. 14.

† 'Meddelelser om Grönland,' Part 4. Copenhagen, 1883, p. 28.

If these figures be compared with my own, it will be found that the difference is found chiefly nearest the surface, a difference which is not difficult of explanation. The winter cold has cooled the layers warm since the summer, but (*ante*, II. 1 and 3) not to such a depth that the whole has been penetrated. There still remains, at a depth of 40 fathoms, some of the summer heat, which may, during the winter and under the influence of icebergs, entirely disappear.

That the first maximum cannot be sufficient to maintain the high temperature at the bottom is self-evident.

V.

In Baffin Bay the expedition found conditions of temperature more complicated still. This bay is, as is generally known, connected with the Atlantic Ocean through Davis Sound and with the Polar Ocean through Jones, Lancaster, and Smith Sounds. This peculiar situation between two oceans of different nature may account for the hydrographical conditions; and the presence of alternating layers of cold and warm water, which were often found in the immediate vicinity of water of a polar character, seems to be characteristic even of Baffin Bay.

Whilst the water of the Atlantic varies but little in specific gravity, that of the Polar Sea varies considerably. During the summer the surface of the sea, generally covered by drifting ice-masses, possesses a very low density, at all events lower than that of the ice-free oceans, while the undiluted lower layers, on account of the low temperature, possess a high specific gravity. A surface of polar water, of low temperature and small saltness, under this a comparatively warm layer, and lowest again a cold one, should, in consequence of these causes, be the simplest condition prevailing at the lower depths of Baffin Bay, and that this is really the case the following serial temperatures will show:—

74° 0′ lat. N. 64° 30′ long. W.	Depth in metres	0	45	90	300	500	700	1000	1450
	Temp. in Celsius	+1°·5	−1°·0	−1°·7	−1°·5	−0°·9	+0°·4	−0°·1	−0°·3

Of the two minima here the lowest is naturally wanting in shallower places.

But besides this simple and regular division of temperature, some very complicated conditions may also be found. The following series shows three maxima and two minima:—

Melville Bay. 75° 20′ lat. N. long. (?)	Depth in metres	0	200	300	400	500	700	820
	Temp. in Celsius	+1°·9	−0°·3	+0°·4	−0°·5	−0°·9	+0°·7	+1°·2

The saltness seems to increase rapidly with the depth. At the surface thus it has been found to be between 2·8 and 3·3 per cent., while at a depth of 625 metres 3·446 per cent. have been found.

A comparison of the observations which the Nordenskiöld expedition made in Baffin Bay in 1883, seems to indicate that, at all events on that occasion, there was, between the polar waters of various specific gravity, a comparatively warm layer of water (above 0°) originated by the Atlantic Ocean, which rested against the shores of West Greenland and followed the same up to Smith Sound.

In the deeper parts of these waters and their northern continuations, Nares * and Moss † believe they found a faint current from the Atlantic Ocean. Moss says with reference thereto: "The channels between the Polar Sea and Smith Sound contain two strata of sea-water, not owing their temperatures to local causes—an upper stratum of polar water overlies a warmer northward-flowing extension of the Atlantic."

GEOGRAPHICAL NOTES.

The New Session of the Society will commence on Monday the 3rd of November, with a paper by Mr. Joseph Thomson on his recent journey through the Masai country to Victoria Nyanza. The second meeting will be held on the 24th of November.

General M'Iver's proposed Expedition to New Guinea.—With regard to General M'Iver's proposal to the Geographical Society of Australasia, recorded in the September number of the 'Proceedings' (p. 537), we have received subsequent information to the effect that the High Commissioner for the Western Pacific having notified to the Society in Sydney that any such expedition in New Guinea at the present time would do harm out of all proportion to the good likely to result, the Society has replied that they had no intention of giving their sanction to the expedition.

Recent News from the River Shire.—Mr. Consul O'Neill, who went from Mozambique to the Zambesi and Shiré in April last, to aid Captain Foot, R.N., in his attempts to restore peace on the Shiré—disturbed by the hostile attitude of the Makololo consequent on the death of the chief Chipatula by the hand of an English elephant hunter—reached the mission settlement of Blantyre by an entirely new land-route from the lower Shiré. He left the river at Chironji, in S. lat. 16° 57′, passing well to the east of the Makololo district viâ Mlolo (or Mongwe Hill), Manasomba or Mangasanji, and the south-west extremity of Milanji. At all these places and a number of others on the route he was able to take astronomical observations, and he promises to send us a narrative of the journey and a map as soon as he is able. At Blantyre he has decided on attempting a series of observations to fix the longitude of the place by way of establishing a meridian in East Central Africa, a desideratum of the highest importance to the accurate mapping of the region. He had already (July 3rd) obtained 136 sets of lunar distances and about 55 sets of moon's altitudes for absolute longitude, besides a large number of independent chronometer observations taken for rating, and he hoped before he left to be able to get 300 more sets of lunars.—Captain Foot, writing from Blantyre on the 8th of July, says

* 'Voyage to the Polar Sea,' vol. ii., London, 1878, p. 158.
† 'Proc. of the Royal Soc.,' xxvii., 1878, p. 545.