guay' in the 'Proceedings' of our Society, vol. xx. (p. 494), bear witness to the thoroughness with which he carried out his mission. They contain a vast mass of accurate and useful information, and the Physical Geography paper especially may be cited as a model study in this department of our science.

In the interval between his return from Paraguay and departure on his ill-fated journey to East Africa, he was busily engaged in independent geographical work in London. Amongst other works produced during this time was the volume on Africa forming part of Stanford's 'Compendium of Geography and Travel' (1878); and the well-known Library Map of Africa, published by his relatives, Messrs. W. & A. K. Johnston. He was also engaged down to the time of his departure from England, and even during the voyage out (for part of the manuscript was posted home from Aden) on another work of similar importance, entitled 'Physical, Historical, Political, and Descriptive Geography,' which is about to be published by Mr. Stanford.

When the African Exploration Fund Committee last year decided on despatching a small expedition to the head of Lake Nyassa, the zeal and abilities of Mr. Johnston pointed him out as the most eligible candidate for employment as leader of the party. Not the least of his recommendations was his evident physical health; the hardships of his Paraguay journey having had no injurious effect, but appearing rather to have strengthened a naturally strong constitution. He left England in November last, and on his arrival in East Africa spent the time before the commencement of the caravan season, i. e. from December to May, as required by his instructions, in preparatory work at Zanzibar and in the neighbouring mainland. During this, the most unhealthy time of the year, the rainy season, he appears not to have suffered from illness in any way, and his letters home were redolent of enjoyment of the country and his work. The reports and maps connected with this preliminary work, which have now been published in these pages, were a sure promise of great things to come when he should have traversed the unknown regions of the interior, and now only make us regret his loss the more.

The "Havildar."—We regret to hear of the death at Jalalabad, of cholera, of Subadar Hyder Shah, of the Bengal Sappers and Miners, better known to geographers under the name of the "Havildar." This adventurous traveller was first brought to the notice of the late Colonel Montgomerie, as a likely man for exploring work, by Lieutenant-Colonel Mansell, Commandant of the Sappers and Miners. The Havildar's first undertaking, after having gone through the necessary training, was to carry a route survey from Peshawar through Swat, Bajaur, Dir and Chitral, over the Nuksan Pass leading across the Hindu Kush Mountains, into the Oxus basin to Faizabad, and thence back by the Dora Pass to Chitral, and so home. This survey was 286 miles in length, over entirely new ground; it accounted for the geography of about 13,000 square miles of *terra incognita*, and was checked by twenty latitude observations at five places. The observations for height by means of boiling point were meagre. But generally speaking, the Sapper's work satisfactorily stood tests applied, and his pluck and endurance were worthy of all praise.

In 1872 the Havildar was employed in making a route survey from Kabul to Bokhara, the result being that the positions of Balkh and Karshi had to be altered, and that some interesting additions were made to our knowledge of those parts. Of this journey no account has been published, as the greater portion of the route traversed had previously been described by others. But we feel sure we are only echoing the feelings of all true geographers when we say that its publication would be most eagerly welcomed.

In 1873 the Havildar, with two companions, started from Peshawar in the disguise of a travelling merchant, and, proceeding by the Abkhana route, passed through

Jalalabad and reached Kabul on the 1st of October. The Havildar crossed the Hindu Kush by the Sar-ulang Pass, the same from which Wood had been driven back by a snow-storm, and thence having journeyed northwards to Faizabad, explored a great deal of unknown territory in Badakhshan, Darwaz, Kolab, and Kubadian, crossing and recrossing the Oxus River four times. His route surveys on this occasion extended over 778 miles.

From the above it will be seen that Hyder Shah's services to geography are most conspicuous, and among the Indian Native explorers second only to those of the Pundit Nain Singh. They undoubtedly call for some public recognition of their value.

CORRESPONDENCE.

The Aurora Borealis.

THE NASH, NEAR WORCESTER,
July 18*th*, 1879.

SIR,—Although the conjecture hazarded more than 160 years since by Halley, that the Aurora Borealis was a magnetic phenomenon, has acquired empirical certainty from Faraday's discovery of the evolution of light by magnetic forces, as well as from more recent observations, the following extracts, translated from a letter written by Herr Pastor emeritus H. M. F. Esmark, may perhaps be considered interesting, Herr Esmark having observed the meteorological conditions attending the display of the polar lights for many successive years:—

"The Aurora is neither seen during extreme cold or northerly winds, but appears when an ordinary Arctic temperature is raised by southerly and westerly winds, and is generally followed by snow. In the south-eastern part of Norway it seems to be especially caused by south-easterly winds, which are there very moist, and rather warm. Its appearance is always accompanied by a falling barometer. In my opinion, the phenomenon is due to the following causes. When a wind laden with warmth, moisture, and electricity comes in contact with a body of cold air, the moisture is converted into snow, the warmth and electricity are thereby released, and the Aurora is the result of the disturbance. The northern lights cannot occur in very high latitudes, because the warm moist air is cooled long before it reaches them."

In this way Herr Esmark would account for the splendid appearance of the Aurora in northern Norway, where the sea winds, bringing warmth, moisture, and electricity from the ocean, are met by cold land winds from the interior. MM. Lottin, Bravais, and Siljerström, who spent a winter at Bosekop in Alten (lat. 70° N.), saw the northern lights 160 times in 210 nights. The most vivid Aurora that I ever saw near Alten was towards midnight on the 12th of November, 1874. The flickering lights played about the masthead so like lightning that it was difficult to believe they were harmless. We had no snow, however, till the evening of the 14th, as we were entering Tromsö harbour, and during the discharges of light the compass-needle was wildly erratic. The determination of the chemical elements involved, by means of spectrum analysis, is by no means the least of the numerous scientific results to be derived from Arctic exploration.

Your obedient servant,

GEORGE T. TEMPLE.

To the Editor of the 'Proceedings R. G. S.'