Here is the Hall apparatus on a small scale. It is simply a carbon-lined iron crucible, and a thick stick of carbon. As already mentioned, the crucible is the cathode, the stick of carbon the anode.

As the process takes time to get into full operation, it was commenced some hours ago, and at the rate at which it has been working we should by now have produced several ounces of aluminium. In beginning the process the charge has first to be melted. This is done by bringing the carbon stick into contact with the bottom of the crucible, so as to allow the current to pass from carbon to carbon to develop heat between the electrodes.

The alumina compound, which, when melted, forms the bath, is added, in powder, little by little, and, when sufficient is melted, the carbon stick is raised out of contact with the bottom, and the electrolytic action then commences.

I will now ask Mr. Sample to empty the crucible and let us see the result of the operation, and while he is doing so I take the opportunity of expressing my very sincere thanks for his having so kindly and so successfully carried out this most interesting demonstration of the latest and one of the most important of all the applications of electricity to metallurgical operations.

Here is the result of our experiment. It is not very large certainly, but it is quite enough for our purpose, which is to illustrate the principle of a newly developed electro-metallurgical industry directly derived from discoveries made at the Royal Institution.

MOUNT MILANJI IN NYASSALAND.

HIDDEN in the recesses of one of the recently issued Parliamentary Papers (Africa, No. 5, 1892) will be found a very interesting report on the mountain and district of Milanji, in British Central Africa, by Mr. Alexander Whyte, F.Z.S., one of Mr. Commissioner Johnston's principal assistants in the task of ruling and developing the new British Protectorate of Nyassaland. Mr. Whyte was sent to Milanji by Mr. Johnston in October last, and dates his report from the "Residency, Zomba, British Central Africa," in the month following. Milanji is a large mountain mass in the extreme south-east corner of Nyassaland, drained on the west by the head waters of the Ruo, one of the affluents of the Shiré, and on the east by the Lukuga and other smaller streams, which run into the Indian Ocean north of the Zambesi. It is described by Mr. Whyte as an isolated range of, for the most part, precipitous mountains, the main mass forming a huge natural fortress of weather-worn precipices or very steep rocky ascents, sparsely clothed with vegetation. Many of its gullies and ravines are well wooded, and in some of them fine samples of grand African virgin forest are met with. Mr. Whyte's ascent, on the 20th of October, was made up the south-east face of Milanji, over steep grassy hills and across rocky streams, full of large water-worn granite boulders. Further on precipices were encountered, and it was necessary to clamber up, holding on by tufts of grass, roots, and scrub, after which a wooded gorge was entered, and welcome shade was obtained from the forest trees.

Here an interesting change in the vegetation was at once perceptible, the plants of the lower slope being mostly replaced by other species. These in many cases approached the flowers of temperate climes, such as brambles and well-known forms of *Papilionaceæ* and *Compositæ*. Ferns, too, became more numerous, and now and again were encountered perfect fairy dells of mosses, Selaginellas, and balsams, with miniature water-falls showering their life-giving spray on the little verdant glades, while overhead hoary lichens and bright festoons of elegant long-tasselled Lycopods hung from the moss-covered trees. After they had passed through some dense thickets of bamboo, and climbed up an ugly barrier of precipitous cliffs, another hour's ascent, the latter part of which was through a steep grassy glen, brought Mr. Whyte and his companions to the highest ridge of Milanji.

Hence was a splendid view over rolling hills of grassy sward divided by belts of dark-green forest, and the climate was found to be delightfully cool and bracing, with a clear dry atmosphere of about 60° Fahr. Altogether two weeks were spent at three different sites on this high plateau, and good collections of its natural history were made, although rain and mist occasionally interfered with the operations of the naturalists.

The flora of the mountain proved to be of great interest, being quite distinct from that of the surrounding plains, and even from that of the lower slopes. Tree-ferns were found to attain a great size in the damp, shady forest, and one was measured 30 feet in height and 2 feet in diameter at its base. The display of wild flowers is described as "gorgeous." Creamy-white and yellow helichrysums mingled with purple and blue orchids and irises, and graceful snow-white anemones were all blooming in wild profusion, and rearing their heads from a bed of bright green grassy sward. But the most striking botanical feature of the Plateau of Milanji was the cypresses formerly apparently quite abundant, but now confined to a few of the upper ravines and valleys, where the annual bush-fires, which take place in the dry months of August and September, cannot reach them. In some places hundreds of these giant trees thus destroyed lay prostrate, piled one above another, in every stage of destruction. One of these dead conifers was found to measure 140 feet in length and $5\frac{1}{2}$ feet in diameter at 5 feet from its base. The foliage of this cypress is juniper-like. The timber, of a dull reddish-white colour, is of excellent quality and easily worked. Ripe cones of this fine tree were procured, and, as stated in a subsequent letter, have already germinated in the experimental garden at Zomba.[1]

The fauna of the mountain was found to be of nearly equal interest to the flora, but in the short space of time available it was not possible to make so nearly a complete collection. Raptorial birds were very scarce, but Passeres were plentiful. The grassy lands of the summits were tenanted by a small dark brown quail, a pipit, two grass-warblers, and the ubiquitous great-billed raven (*Corvultur albicollis*), which, however, was not so numerous as on the plains below. In the adjoining forest bird-life was abundant. Bul-buls, fly-catchers, warblers, finches, and honey-birds joined in chorus in celebrating the springtime and nesting season, which was then in full progress. Altogether about 200 specimens of birds were obtained. Of mammals few were met with. The beasts of prey consisted of the leopard, the spotted hyæna, the serval, and an ichneumon. Examples of three species of *Muridæ* were also obtained, and a little antelope, probably of the genus *Neotragus*, was observed, but not procured. A few snakes were likewise met with.

As regards the question of establishing a sanatorium on the Milanji Plateau, to which special attention had been directed, Mr. Whyte has no hesitation in saying that the climate of this district contrasts very favourably with that of some of the hill-stations in India and Ceylon. The year is pretty equally divided between wet and dry months, the former lasting from November till May, while the other six months are stated to be fine, clear, and bracing, the thermometer at night in the months of May, June, and July occasionally falling below the freezing point. In the month of October the air was found to be delightfully pure and balmy. We believe that steps have already been taken to build a small station on Milanji, but to render this of much use it will be necessary to form a road to it from the falls of the Ruo up the Lutshenya valley. This could be made with fairly good gradients, and would be of great advantage as an outlet for the cypress-timber, which now lies useless and decaying in the forest.

We are pleased to be able to add that Mr. Whyte's collections above spoken of, along with others from Mount Zomba, have already reached London, and are in the hands of Mr. Sclater, to whom Mr. Johnston has entrusted the task of getting them worked out and described. Mr. Oldfield Thomas has already commenced to determine the mammals, Captain Shelley will name the birds, and Mr. Boulenger, it is believed, will undertake the examination of the reptiles and batrachians. The plants will be examined in the Botanical Department of the British Museum, in which institution Mr. H. H. Johnston has directed the first set of specimens in every department to be deposited. The zoological results will be published in the "Proceedings" of the Zoological Society of London.

OBSERVATIONS OF THE PLANET MARS.[2]

I OUGHT to have written to you before on the subject of the planet Mars, which I have been studying for over four months with our great equatorial. My great desire to verify the

[1] Some cones of this supposed "Cypress" have also reached the Botanical Department of the British Museum, and have proved to belong to a Conifer of the genus *Widdringtonia*, probably of a new species. But this point cannot be definitely settled until more perfect specimens of the tree have been received.

[2] Letter from M. Perrotin to M. Faye, *Comptes rendus*, September 5.

extraordinary phenomena to which I alluded in my last letter may account for this.

Besides, I have gained nothing by waiting, and at the present time, after successive delays which I much regret, I am hardly further than I was a month ago. Owing, perhaps, to the images being less satisfactory, or to the phenomena in question not having recurred, nothing has been added to my first observations.

The phenomena alluded to are brilliant projections, comparable in colour and brightness to the southern pole cap, observed on three different occasions—viz., June 10 and July 2 and 3, on the western limb of the planet.

The last time, July 3, I was able to observe the several phases of this singular appearance. On that day the luminous point began to emerge on the edge of the disc at 14h. 11m. (local astronomical time), very faint at first; then I saw it gradually increase, pass through a maximum, and then diminish, to disappear finally about 15h. 6m. The facts would not have been different had it been a case of an elevation of the surface of Mars traversing the illuminated edge of the disc by the simple effect of the rotation of the planet. The phase which affected the western limb of the planet at that time, could only modify it in amount and in duration. The previous night, July 2, I had seen the crescent in a phase approaching the maximum, at 14h. 10m., and I was able to follow the bright point up to its complete disappearance at 14h. 40m.

On July 2 and 3 the things happened in the same part of the disc, about the 50th parallel of latitude, and with a retardation of half an hour against the previous day, as usual for a thing taking place in the same region of the planet.

The first observation of this kind goes back as far as June 10, when it lasted from 15h. 12m. to about 16h. 17m. This time the bright point occurred in the vicinity of the 30th southern parallel, probably in the southern portion of the isthmus Hesperia of Schiaparelli's chart.

I may add that during these observations the portion of the disc adjoining the small protuberance has always appeared to me slightly deformed and as if raised.

Such are the facts. I shall not attempt to interpret them. They presented themselves with such clearness that it is hardly possible to consider them as the result of any illusion.

On the other hand, since it is a question of projection beyond the disc of at least one or two tenths of a second of arc, that is to say, of phenomena at a height of more than 30 or 60 km., one feels overwhelmed by such numbers, to which we are not accustomed on our globe, and it is undoubtedly luminous phenomena only which could explain heights like that.

The southern snow cap has been the object of several measurements, which will be published with the drawings of this opposition. This cap has notably diminished in the last two months; it is, in fact, shifting; it is traversed by at least two black lines, a kind of crevices analogous to those which I announced in 1888 in the case of the northern cap. The first of these lines was seen at the end of June, the second on August 8.

The outline is now more irregular than in the past; in particular there is seen, between the meridians of 300° and 0° (Schiaparelli's map), a deep black hollow which grows steadily.

Although the actual conditions are not very favourable for the canals (at least for a portion of them), several are well visible; some are apparent enough to convince the most prejudiced observers.

Two of our drawings of the Great Syrtis, made at widely different dates, indicate some slight changes in the most northerly portion of this sea. They are no doubt due to mists and clouds, which have sometimes appeared to me to invade the northern regions on the east of this Great Syrtis, hiding the canals which traverse them, and only allowing us to see their most southern portion.

Our drawings of the Lake of the Sun, when compared with those of M. Schiaparelli, also indicate some changes of detail in the aspect of the lake itself and of the seas and canals surrounding it.

The most interesting observation of this month is the one I have made, on August 6, of a very bright point placed precisely a little to the north of this Lake of the Sun. This point, which struck me by its extraordinary radiance, could not be seen the next day; if it still existed—the images were not so good as the previous night—it was certainly much less luminous.

This phenomenon, and the analogous phenomena sometimes noticed on the surface of the planet, are perhaps not without some relation with the appearances of the limb which I have announced. Future observations will no doubt inform us on this subject.

I should perhaps have still deferred sending this letter if I had not, within the last few days, received from Mr. Newcomb the extract of a journal, in which it is reported that the Lick astronomers have also observed the luminous projections on the edge of the disc.

I may add that in the beginning of July I had imparted my observations to M. André, director of the Lyons Observatory, who happened to be on a visit to Mont Gros, and whom I had invited to come on the 5th and verify the strange appearances which I had told him of. Unfortunately, the sky remained obscured all night, and my project could not be carried out.

SCIENTIFIC SERIALS.

THE *American Meteorological Journal* for August contains:—Synoptical sketch of the progress of Meteorology in the United States, by W. A. Glassford, and reprinted from the annual report of the chief signal officer for 1891. From this summary it appears that Isaac Greenwood, a professor of mathematics in Harvard College, prepared a form for observations at sea in 1728, thus anticipating the efforts of Lieut. Maury by more than a century. Observations of temperature and rainfall were begun in Charleston in 1738, and were soon followed by several other series. In 1817, J. Meigs, Commissioner of the General Land Office, proposed to Congress the establishment of meteorological stations at each of the land offices, and as this proposal was not adopted, he started a voluntary system among his subordinates, and supplied registers for the purpose. This system lasted until his death in 1822. The next service was established by the Surgeon-General of the Army, in 1819, and was maintained, with modifications, until 1854, when the records were handed over to the Smithsonian Institution, and in due time were transferred to the Signal Service. The Patent Office, of which agriculture formed a division, and the Coast Survey also manifested great interest in the science. The article contains a good review of the labours of the principal American meteorologists.—Note on winter thunderstorms; by Prof. W. M. Davis. He asks whether the convectional origin of thunderstorms in summer implies a like origin for thunderstorms in winter, even though they occur then at night, and he explains the reasons which seem to favour this supposition.—Objections to Faye's theory of cyclones; by W. C. Moore. The writer attempts to show why the generally accepted theories seem to him preferable to those brought forward by M. Faye. The discussion is to be continued in a future number.—Artificial rain; by E. Powers. The writer is the author of a work entitled "War and the Weather," and he supports the view that rain can be artificially produced, and endeavours to refute the objections urged by Prof. W. M. Davis and others.

Wiedemann's Annalen der Physik und Chemie, No. 8.—On the refraction of rays of great wave-length in rock-salt, sylvine, and fluorspar, by H. Rubens and B. W. Snow. A series of bolometric researches concerning the infra-red rays, to determine the refractive indices of the three substances for light of various wave-lengths up to $\lambda = 80,000$. Fluorspar, though showing a lesser dispersion than the other two in the visible portion, excelled them enormously in the infra-red, hence it is specially suited for the production of prismatic heat spectra.—Reflection and transmission of light in certain æolotropic structures, by H. E. J. G. du Bois. An æolotropic structure is a portion of matter, generally plane, in which it is possible to fix upon an optically favoured direction. This can be due to its coarse macroscopic or its molecular and microscopic structure. In both cases vertically incident or reflected light will be acted upon differently according as its plane of polarization is parallel or normal to the favoured direction. This action is in general unequal as regards both the amplitude and the phase of the two components. The objects experimented upon were, in the first class, bright silver wire gratings, platinum film gratings, scratched metal reflectors, and scratched glass gratings; in the second class, crystals of cobaltine and pyrites, and a loaded steel mirror. In the case of the silver wire gratings it was found that light polarized in a plane normal to the direction of the wires was let through in greater intensity