form might be had at a certain spot and no capital were required for its conversion or storage, and that the energy were directly applicable it could not be carried ten miles—that is to say, such energy cannot be economically useful ten miles from its source, although coal had to be carried 100 miles to the spot. This limit, in truth, falls far short of what has been already attained by other means. By wire ropes and by compressed air or steam energy may be economically transmitted from ten to twenty miles. So that if this is the utmost of what is to be done by means of the storage of electricity this discovery adds another door to those which are hopelessly closed against the possibility of finding in Niagara or other water power a substitute for our coal, even when the object is motive power, and much more for that purpose for which five-sixths of our coal is used—the production of heat.

It is very important that the people of this country should not shut their eyes to the fact that, so far from there being a greater prospect of the solution of the problem than when, about twenty years ago, Prof. Jevons raised the alarm, the prospect is now much smaller. In the meantime the capabilities of steel ropes, fluids in pipes, and electricity along conductors have been not only investigated, but practically tested, and found altogether wanting. And now it would seem that the storage of electricity must be added to the list. OSBORNE REYNOLDS

Owens College, June 9

YOUR leading article in the *Times* of yesterday, on the storage of electricity, alludes to my having spoken of Niagara as the natural and proper chief motor for the whole of the North American Continent. I value the allusion too much to let it pass without pointing out that the credit of originating the idea and teaching how it is to be practically realised by the electric transmission of energy is due to Mr. C. W. Siemens, who spoke first, I believe, on the subject in his presidential address to the Iron and Steel Institute in March, 1877. I myself spoke on the subject in support of Mr. Siemens's views at the Institution of Civil Engineers a year later. In May, 1879, in answer to questions put to me by the Select Committee of the House of Commons on Electric Lighting, I gave an estimate of the quantity of copper conductor that would be suitable for the economical transmission of power by electricity to any stated distance; and, taking Niagara as example, I pointed out that, under practically realisable conditions of intensity, a copper wire of half an inch diameter would suffice to take 26,250 horse-power from water-wheels driven by the Fall, and (losing only 20 per cent. on the way) to yield 21,000 horse-power at a distance of 300 British statute miles; the prime cost of the copper amounting to 60,000*l.*, or less than 3*l.* per horse-power actually yielded at the distant station. WILLIAM THOMSON

The University, Glasgow, June 9

IF you do me the honour to publish a letter which I wrote to you yesterday regarding the electric transmission of energy it will be seen that I thoroughly sympathise with Prof. Osborne Reynolds in his aspirations for the utilisation of Niagara as a motor, but that neither Mr. Siemens nor I agree with him in the conclusion which he asserts in his letter to you, published in the *Times* of to-day, that electricity has been tried and found wanting as a means for attaining such objects. The *transmission* of power was not the subject of my letter to you published in the *Times* of the 9th inst., and Prof. Reynolds' disappointment with M. Faure's practical realisation of electric *storage*, because it does not provide a method of *porterage* superior to conduction through a wire, is like being disappointed with an invention of improvements in water cans and water reservoirs because the best that can be done in the way of movable water cans and fixed water reservoirs will never let the water-carrier supersede water-pipes wherever water-pipes can be laid.

The 1½ oz. of coal cited by Prof. Osborne Reynolds as containing a million of foot-pounds stored in it is no analogy to the Faure accumulator containing the same amount of energy. The accumulator can be re-charged with energy when it is exhausted, and the fresh store drawn upon when needed, without losing more than 10 or 15 per cent. with arrangements suited for practical purposes. If coal could be unburned—that is to say, if carbon could be extracted from carbonic acid by any economic process of chemical or electric action, as it is in nature by the growth of plants drawing on sunlight for the requisite energy—the result would be analogous to what is done in Faure's accumulator. WILLIAM THOMSON

The University, Glasgow, June 11

DR. MIKLUCHO MACLAY'S ANTHROPOLOGICAL AND ANATOMICAL RESEARCHES IN MELANESIA AND AUSTRALIA[1]

AFTER I had left Sydney in March, 1879, I visited the following islands: New Caledonia, Lifu; of the New Hebrides: Tana, Vate, Tongoa, Mai, Epi, Ambrim, Malo, Vanua Lava; the Admiralty Islands; the groups—Lub (or Hermit), Ninigo (Echiquier), Trobriant, the Solomon Islands, the islands at the south-east end of New Guinea, and the islands of Torres Straits.[2]

Only a very few of the results of the journey can be comprehended in a short *résumé*, of these the first two of the following appear to me to be the most important:—1. Many islands of Melanesia[3] (especially some of the islands of the New Hebrides, of the Solomon Group, of the Louisiades, New Ireland, &c., &c.) possess a well-marked brachycephalic population (the breadth-index of many heads exceeds eighty, and sometimes even eighty-five), which circumstance is assuredly not ascribable to a mixture with another race, and proves that brachycephalism has a much wider range in Melanesia than has been hitherto supposed. This is a result of numerous careful measurements of heads and skulls[4] of the aboriginals of different islands of Melanesia. 2. Although in some villages of the southern coast of New Guinea there is noticeable a Polynesian admixture, yet this circumstance by no means permits of the aboriginals of the south-eastern peninsula (who are a branch of the Melanesian stock) being called a "yellow Malayan race," as has been frequently done of late years. 3. An acquaintance with the languages of the group Lub (or Hermit) and the dialects of the northern coast of the large island of the Admiralty Group, as well as the native traditions of the former, has shown that the population of the group Lub emigrated from the Admiralty Islands. Further acquaintance with the natives of Lub proved that there is among them a Polynesian admixture, which has resulted from the carrying off of the women of the group Ninigo, and from a frequent intercourse with the inhabitants (also a Melano-Polynesian race) of the smaller group Kaniet or Kanies (or Anchorites). My stay among the inhabitants of the Admiralty Islands has afforded me a glimpse of many interesting customs of the islands; but an account of these observations and researches cannot be condensed within the compass of a few sentences. To this series of results belong also the observations which I never neglected to make during the journey in Melanesia whenever the opportunity presented itself—especially observations on their customs, such as the deformation of the head, tattooing, perforation of the septum narium, alæ nasi, lobes and margins of the ears. I have also succeeded in making further observations, and obtaining more information, on the macrodontism in the Admiralty and Lub islands.

On my way back from the islands of Torres Straits I visited Brisbane, where I at first only intended to remain a few days. Here however a favourable opportunity presented itself of acquiring some interesting anatomical material for my anthropological researches, which circumstance induced me to prolong my stay for several months. I found, namely, that there was a possibility of continuing my researches on the comparative anatomy of the brain of the different varieties of the genus *homo*, which were commenced in 1873 in Batavia and resumed in Sydney in 1878. Although the material in question consisted only of three brains, yet I find that this new contribution to our knowledge of race-anatomy supports the view which I may briefly summarise as follows:—The investigation of the brains of representatives of different races of men shows that there occur peculiarities of by no means trifling import, which one cannot regard as individual variations. To this category belong differences in the development of the corpus callosum of the pons varolii, of the cerebellum; differences in the volume of the cranial nerves, and so forth; also the arrangement of the convolutions of the cerebrum is different, and I believe that in

[1] From a paper read before the Linnean Society of New South Wales February 23, 1881, by Dr. N. De Miklucho-Maclay. Revised and transmitted by the author.

[2] A more detailed account of the route, of the time spent at the different places, with sketch-maps of the routes and other details, will be found in my communication to the Imperial Russian Geographical Society, in the Jswestija of the Society.

[3] By the name "Melanesians" I designate exclusively the frizzly-haired inhabitants of the South Sea Islands.

[4] In order to eliminate any doubt as to the correctness of the cranial measurements on living individuals, I have not neglected to collect a considerable number of undoubtedly authentic skulls from New Caledonia, New Guinea, the Admiraltys, Ninigo, and Solomon Islands.

course of time it will probably be discovered that there exist certain definite types of cerebral convolutions corresponding to the principal varieties of mankind. In order to discover those types much material will require to be conscientiously examined; and I hope that my investigation will induce other anatomists to work in this direction to prove or to disprove this statement, which in the present state of our knowledge can only be more or less hypothetical.

On my way from Thursday Island I let slip no opportunity of examining, measuring, and photographing the remnant of the Australian aboriginals; and hearing it stated in various quarters that there were living in the interior of Queensland certain natives described as devoid of hair, I thought the problem of a possible occurrence of a hairless stock among the aboriginals worthy of a personal investigation. I have written to Prof. Virchow of Berlin at length concerning my examination of this hairless family, which I found at Gulnarber Station, near St. George, on the Balonne River. This was made considerably easier for me by the kind assistance of Mr. G. M. Kirk of Gulnarber Station. As regards this instance of natural, and in this case hereditary *atrichia universalis* among the Australian aboriginals, I will only remark that it forms an interesting antithesis to the well-known cases of excessive hypertrichosis.

With a view of pursuing comparative anatomical researches on the brain of the marsupials, I went to Pikedale, near Stanthorpe, where I succeeded during a stay of almost six weeks in acquiring for my cerebral investigations some material which is almost impossible to obtain in the cities, such as Brisbane or Sydney, and which, as I have learnt by my own experience, cannot be obtained even in the bush with great ease and quickness. I succeeded, however, in obtaining a number of brains of some species of the genera—Macropus, Osphranter, Halmaturus, Petrogale, Phascolarctos, as well as a few brains of Ornithorhynchus and Echidna.

At the end of December last year, still availing myself of the kind hospitality of Mr. Donald Gunn, I went on to his other station, Clairvaul, near Glen Innes, with the intention of collecting some fossils, and without great trouble I got a series of interesting remains of *Diprotodon Australis*, *Nototherium Mitchellii*, *Phascolomys gigas*, *Macropus titan*, &c., &c.

When I received in May, 1880, in Thursday Island, a letter from my friend Mr. William Haswell, informing me that the Zoological Station in Sydney was not established, I determined not to leave Australia before the scheme had been carried out. Detained in Queensland by the work already referred to, I only arrived in Sydney in January of this year, and now, after a stay of one month, I have the pleasure to announce that I have every reason to believe that the Zoological Station at Watson's Bay will be opened in a short time. My stay in Brisbane has once more caused me to feel the *necessity* of such an institution for the biologist. I could expatiate at length on the advantages of a zoological station, but I content myself with remarking that, in spite of my great dislike to waste my time, I was obliged to spend many days, even weeks, in Brisbane and Sydney without the possibility of working, on account of the want of a suitable place.

I repeat again my conviction, grounded on long experience, that "the immediate need is not of apparatus or libraries, but of a place for undisturbed work."[1] I hope to be able, not later than in two months, to work in the Zoological Station in Watson's Bay. I am convinced that many men of science will avail themselves of it in future years; and I am satisfied to leave for future generations such a memento of my stay in Sydney as the first zoological station in Australia.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIGE.—The Physiological Laboratory (Dr. Foster's) will be open during the Long Vacation, and a series of repetitions of lectures and demonstrations will be given by Mr. Waters, the Assistant Demonstrator, in Elementary Biology, Histology, and Physiology.

The Cavendish Laboratory will be open during July and August, and the Professor of Experimental Physics or one of the Demonstrators will attend daily.

Prof. A. C. Haddon, of the Royal College of Science, Dublin, has been nominated by the Board of Natural Science Studies to study at the Zoological Station at Naples during the ensuing autumn.

The Board of Mathematical Studies has issued a report showing that in the last Mathematical Tripos the total of marks was 33,541, of which the first ten wranglers averaged 8582. In the last five days 11,753 marks were assigned to riders, and 7770 to problems; of which the first ten wranglers averaged 2388 and 936 respectively. The additional examiner stated his satisfaction with the answering; and he considered that much of the time formerly occupied by the study of astronomy, including the Lunar and Planetary Theories, Figure of the Earth, and Precession of Nutation, was now devoted to Heat, Electricity, and Magnetism. Comparing the progressive nature of the latter subjects with the stationary nature of the former, the latter afford the best means of testing the mathematical ability of the candidates.

Prof. Cayley will lecture in Michaelmas Term on Abel's Theorem; Dr. Ferrers (Master of Caius) on the Theory of the Potential; Mr. Niven (Trinity) on Electrostatics; Mr. Glaisher (Trinity) on Definite Integrals and Differential Equations; Mr. Hobson (Christ's) on Rigid Dynamics; Mr. Stearn (King's) on Conduction of Heat and Electricity; Mr. Allen (St. Peter's) on Magnetism; Mr. Dickson on Dynamics of a Particle.

The annual report of Prof. Adams to the Observatory Syndicate states that, notwithstanding the exceptionally unfavourable weather for observing, there had been made 2834 determinations of Right Ascension and North Polar Distance with the transit circle, including 2151 observations of zone stars which were made on eighty nights. Satisfactory observations of the partial solar eclipse, December 31, 1880, were obtained with the Northumberland equatorial, employing the wire micrometer. The observations with the transit circle for nadir point and level have been facilitated and rendered much more satisfactory by an alteration in the mode of illumination of the wires through the Bohnenberger eyepiece. Instead of placing a small hand-lamp on a stand close to the eyepiece, which gave an uncertain image at the best, the illumination is now effected by means of a paraffin lamp placed on a platform at the requisite elevation about ten feet from the eyepiece. The rays for the lamp are rendered parallel by passing through the system of lenses intended for the illumination of the microscopes of the eastern circle, which is not in ordinary use. There is now no difficulty in getting the light properly directed, and the images both of the Right Ascension and Declination wires are dark and very distinct. The observations of standard stars are completely reduced in R.A. and N.P.D. to the end of 1879 and part of 1880, as to the zone stars, the true R.A. and N.P.D. are obtained to the end of 1878, the approximate N.P.D. to the end of 1879. The calculation of reduction of apparent place to mean is completed to the end of 1876, and is far advanced for 1877. Meteorological observations are regularly made. A third assistant in the Observatory is urgently needed.

The following awards have been made by the Master and Seniors of St. John's College for proficiency in Natural Sciences:—To Samways, a Wright's Prize, with 100*l.* for the year; to Weldon, Edmunds, Love, T. Roberts, Foundation Scholarships; to Pagan, Goodman, Exhibitions. The Open Natural Science Exhibition was awarded to H. Wilson of the Leys School, and another Open Exhibition to J. Kerr of Manchester Grammar School.

SCIENTIFIC SERIALS

Trimen's Journal of Botany, June, 1881, contains:—Notes on *Carex flava*, L., by F. Townsend, M.A.—A revision of the Indian species of Leea, by C. B. Clarke, M.A.—Notes on Irish plants, by H. C. Hart, B.A.—Short notes.—Extracts and notices of books and memoirs.—Botanical notes.

THE *American Naturalist*, June, 1881, contains:—The archæology of Vermont, by Prof. Geo. H. Perkins.—On the larval habits of the Bombyliidæ, by C. V. Riley (with a coloured plate).—On the late explorations in the Gaboon, by H. von Kopenfels.—On the Pueblo pottery, by Edwin A. Barber.

Kosmos, Jahrgang v. Heft 2, contains:—Prof. Dr. Fritz Schultze, on the relations of sceptical naturalism to modern natural science, with especial reference to the evolution theory (conclusion).—Henry Potonié, on the relations of morphology to physiology.—Dr. Fritz Müller, *Atyoida Potimirim*, a mud-eating fresh-water shrimp (with twenty woodcuts).

[1] *Vide Proceedings* of the Linnean Society of New South Wales, August 26, 1878.