impure for the purpose, the preparation of a cubic metre of oxygen was undertaken. The gas was prepared by electrolysis, conducted through purifying apparatus, and compressed into a steel cyclinder of 10 litres capacity, at a pressure of 100 atmospheres by the mercury compressor. The gas in the cylinder appeared to contain nearly 99 per cent. of oxygen. How many laboratories exist in which such a thing could be performed?

As to low temperatures, in No. 6 we notice the measurement of the capillary elevation of ether at -102° in boiling ethylene; in No. 18, of the same magnitude for carbonic acid and nitrous oxide at -24° in boiling methylchloride. Nos. 4, 16, 18 contain the description of a method for purifying gases by condensation and fractional distillation at low temperature, in a bath of ethylene or in solid carbonic acid, the gases purified being carbonic acid, methylchloride, nitrous oxide, and ethane. Finally, we may note the measurement of the viscosity of methylchloride at -30° in cooled alcohol.

The different investigations hitherto carried out may be arranged under the following headings.

I. Cryogenic department: condensation of methane, isothermals of hydrogen at low temperatures, &c. (Nos. 14, 23.)

II. Investigations regarding critical points and condensation of mixtures and of pure substances. (Dr. Kuenen. Nos. 4, 7, 8, 11, 13, 16, 17.)

III. Measurements on the capillarity of ether, carbonic acid, nitrous oxide, &c. (Drs. de Vries and Verschaffelt. Nos. 6, 18.)

IV. Measurements on the viscosity of methylchloride in connection with the laws of corresponding states of matter. (Drs. Stoel and de Haas. Nos. 2, 12.)

V. Series of experiments on Kerr's magneto-optical phenomenon, &c. (Drs. Sissingh, Wind and Zeeman. Nos. 1, 3, 5, 8, 9, 10, 15, 20.)

VI. Some experiments regarding Hall's phenomenon in bismuth. (Dr. Lebret. Nos. 15, 19.)

VII. On Hertz-waves in water and in electrolytes. (Dr. Zeeman, partly in conjunction with Prof. Cohn, Strassburg. Nos. 21, 22.)

VIII. Observations on the dispersion of magnetic rotation in gases. (Dr. Siertsema. Nos. 7, 15.)

The scope of this article does not allow of a further description or discussion of any of the above investigations. One instance will show the scale on which the experiments are carried on, if deemed necessary. For the observations mentioned under VIII., two coils were constructed, each of 1 metre length and with 3600 turns of 6 mm. wire, the joint resistance of the coils in series being 1 ohm, and the current carried 70 amperes.

Besides a dynamo there are two or three sets of accumulators, which make it possible to work simultaneously at two or three investigations for which strong currents and electric lamps are required. In short, the place is rich in apparatus of all kinds, and possesses numerous appliances; so much so, that one would rank it amongst the best provided (and, one may add, most productive) research laboratories. It is worth observing, that in Holland private munificence is hardly ever directed towards scientific work, and that the whole of this laboratory, as of all the others in the three Government Universities—Leiden, Utrecht, Groningen—are kept up from the public purse. It is only recently that, under the strain of the competition between the Universities, private societies have been founded to promote University work, where the Government shows itself unwilling or unable to provide the necessary means.

Those to whom these "Communications" are unknown, and who are desirous of becoming more intimately acquainted with their contents, have only to apply for copies to receive them. Prof. Onnes will, moreover, be very glad if physicists, touring in Holland, would alight at the famous University town, and in their programme include a visit to his laboratory.

THE GREAT RIFT VALLEY.[1]

IT is but rarely that a narrative of travel, however interesting it may be, and however exciting the adventures of the author may have proved, has as much attraction for naturalists and geologists as the present volume possesses. Dr. Gregory has shown himself a thoroughly competent explorer, for he succeeded in reaching the glaciers close to the summit of Mount Kenya, the highest peak of British East Africa, a task in which several previous travellers had failed; and he also examined a considerable length of the extraordinary tract that gives its name to the book before us. This, too, was accomplished with a much smaller caravan than was regarded by experienced men as necessary for safety; in face of difficulties, due to the proclivities of the natives and to scarcity of food, that would have daunted many men; in spite of the utter failure of the expedition to which the author was originally attached; and, above all, despite severe attacks of malarial fever and dysentery. "The Great Rift Valley," apart from its scientific interest, gives a very interesting account of an adventurous exploit, carried out with courage and firmness, and, at the same time, with kindly treatment of the natives employed and encountered.

It is, however, not as a record of exploration alone that this book needs notice. Explorers equal to Dr. Gregory in courage and tact, and perhaps superior to him in the power of resisting malarial influences, have made their way through many of the forests and deserts of Africa, and have told some of the secrets of the Dark Continent to an appreciative audience; but very few of those who returned to tell the tale of their adventures possessed the scientific training that gives an especial value to Dr. Gregory's account of his travels. In this respect the author of the present work is singularly qualified. In the era of specialisation in science that we have now entered upon, it is becoming rare to find a geologist who knows anything of zoology or botany, or a zoologist or botanist who can tell schist from shale or sandstone from granite; whilst it appears to be rapidly becoming a point almost of honour with the geologists, zoologists, and botanists of the British Islands to regard palæontology as an inferior science. It is therefore noteworthy that Dr. Gregory, who is a palæontologist, should have brought back from Eastern Africa a mass of observations that could not have been accumulated by a geologist ignorant of biology, nor by a zoologist or botanist unacquainted with geology.

Briefly the history of the journey described is this. In November 1892, Dr. Gregory received leave of absence from the Trustees of the British Museum to enable him to join an expedition to Lake Rudolf. From various causes this expedition was a failure. After the dispersal of its members, Dr. Gregory went on to Mombasa, where he engaged a small party of porters, and in March 1893 started for Lake Baringo and Mount Kenya, and succeeded in reaching both. The journey occupied five months, and the expedition returned to Mombasa in August.

The arrangement of the present work is the following. After an introduction, giving a general account of previous exploration, and of the geology of the area as known before the author's visit, the first three chapters relate his experience with the abortive expedition which started from Lamu to explore Lake Rudolf and the regions between that lake and the Red Sea, but never got beyond the lower reaches of the Tana River; then eight chapters contain a description of the journey to Baringo and Kenya; and the third part of the book, comprising

[1] "The Great Rift Valley: being the Narrative of a Journey to Mount Kenya and Lake Baringo, with some Account of the Geology, Natural History, Anthropology, and Future Prospects of British East Africa." By J. W. Gregory, D.Sc., F.G.S., F.R.G.S., F.Z.S., of the British Museum (Natural History). (London: John Murray, 1896.)

seven chapters and three appendices, affords a general summary of the scientific results.

The "Great Rift Valley," of which the characters were first indicated by Suess, is a fissure in the earth's surface into which, or into portions of which, a strip of the surface itself has been let down by parallel faults. The cliffs formed by the faults have not been removed by denudation, and the necessary inference is that the dislocation—partially, at all events—is of small geological antiquity. The great fissure itself is regarded as similar in character to certain lines, resembling cracks, that have been observed on the moon's surface; it has been traced at intervals from the valley of the Zambesi to Lake Rudolf, and it is supposed to be connected through the trough of the Red Sea with the depression containing the Jordan Valley and the Dead Sea in Palestine. From Lake Rudolf a branch rift appears to diverge to the west, and to lead through Lakes Albert and Albert Edward to Tanganyika; whilst south of Lake Rudolf the eastern branch, our knowledge of which has been materially increased by Dr. Gregory's examination, contains several smaller lakes—Baringo and Naivasha, amongst others—and probably terminates to the southward in Lake Nyassa. Altogether this wonderful north and south trough is regarded as having a length of 4000 miles, and is said to contain thirty lakes, of which only one has an outlet to the sea. Evidently only the eastern branch of the rift is referred to, fo ithree large lakes in the western branch—the Lakes Albert, Albert Edward, and Tanganyika are drained by the Nile or the Congo.

The principal additions to our knowledge of the "Great Rift Valley" are two in number. Dr. Gregory has shown, apparently beyond any chance of error, that the portion of the valley examined by him—fifty to seventy miles on each side of the equator, or about 120 miles in all—is actually let down by faults on each side. He has also shown that great changes in elevation must have occurred throughout the area in comparatively recent geological times, and that one of these led to the formation of a large lake, of which traces are left in the form of terraces on some of the scarps that bound the Rift Valley. To the ancient lake Dr. Gregory applies the name of Lake Suess; and, if a name is required, no more appropriate one could be devised.

The discoveries on Kenya were even more important than those in the Rift Valley, for not only did Dr. Gregory find glaciers, but he met with clear evidence that these glaciers formerly descended more than 5000 feet lower down the mountain than they now do. Reasons are given—one of the most important being the absence of any similar evidence on Kilimanjaro—for doubting whether the former extension of glacial action on Kenya was due to a general refrigeration of the earth's surface in the glacial epoch, and it is inferred that Kenya and the surrounding area have undergone depression since the period of maximum glaciation on the mountain. This may be the case, but it leaves the great difficulty of the whole question unexplained; we have still to account for the isolated occurrence of temperate plants, both of northern and southern types, on all the Central African mountains.

A considerable mass of interesting details on the geology of the country lying between the coast and the Rift Valley is given, and incidentally, with reference to the great lava plains traversed, their origin is discussed and a theory put forward to account for the phenomena.

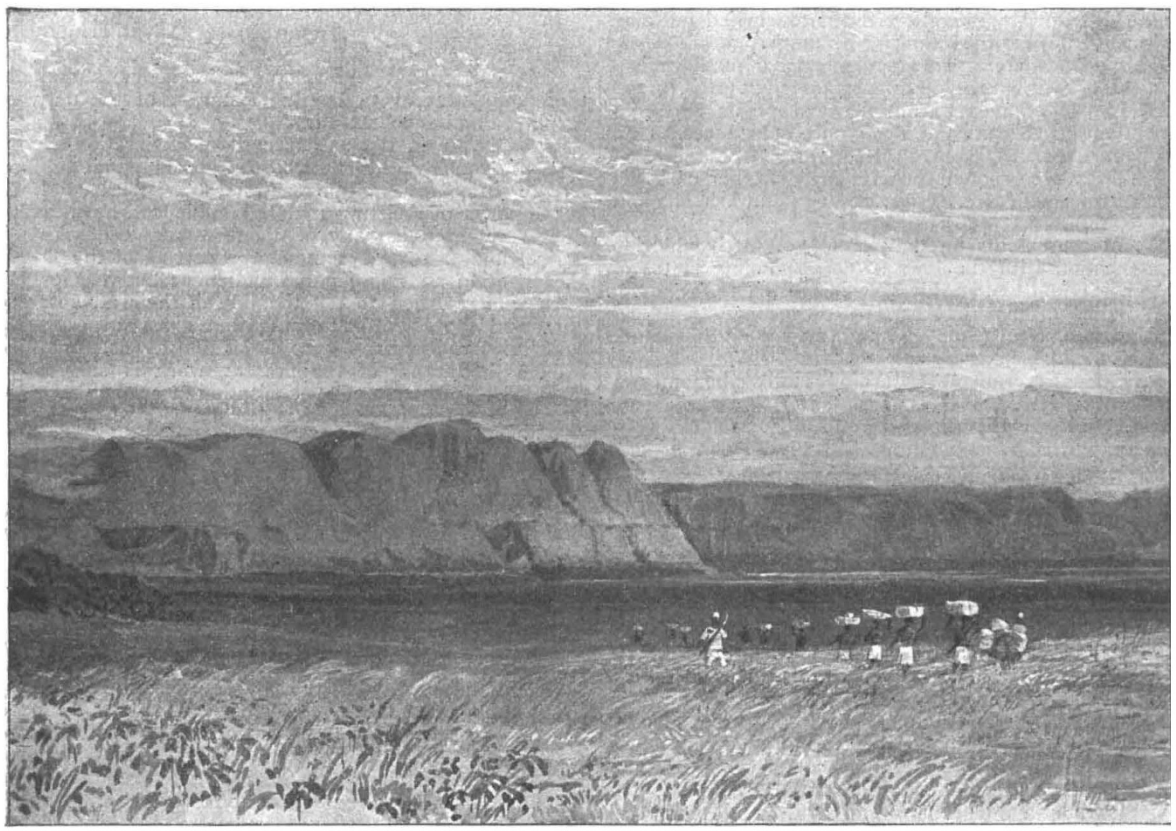

FIG. 1.—The Eastern Wall of the Rift Valley, with the Terraces of Lake Suess.

It may, however, be doubted whether this theory, which its author terms that of plateau eruption, is really different from the explanation of the so-called fissure eruptions given in Sir A. Geikie's text-book.

It is when we pass from the purely geological chapters to those portions of the work that refer to the East African fauna and flora, and to the descriptions of the various tribes who inhabit the country, that we come to what will probably prove to many readers the most attractive portion of Dr. Gregory's work. The pages relating to the present and past distribution of life teem with original suggestions, and many of the observations made on the journey are highly novel and interesting. Amongst these are some curious cases of mimicry, especially that represented in the frontispiece to the volume, in which a group of hemipterous insects, red and green, presents an astonishing similarity to a flower-spike. Remarkable examples are given of the disappearance of wild animals, such as buffaloes and giraffes, throughout a very large tract of country, in consequence of disease; whilst observed instances of the destruction of great numbers by drought, and the accumulation of their skeletons around isolated water-holes, are suggested as perhaps accounting for some of the enormous masses of mammalian bones that are found imbedded in particular strata. It is not necessary to agree with suggestions of this kind in order to recognise their value; and unquestionably under the conditions pointed out, if the bones are, soon after the death of the animal, enclosed in silt or gravel, they may be preserved. Bones exposed on the surface, however, especially in the tropics, decay and break up with great rapidity, and the accumulations of fossil bones occasionally found are more probably due to carcases, carried down by a river flood, having collected in a backwater or on a sandbank.

One example of a suggestion of the author's, peculiarly illustrative of his double range of investigation, as geologist and as biologist, may here be noticed. It has long been known—we are indebted to Dr. Günther for the original facts—that the fresh water fish-fauna of the Jordan and Sea of Galilee resembles in certain peculiarities, such as the presence of the genus *Hemichromis*, that of the Central African lakes more than that of Northern Africa and of the lower Nile basin. Dr. Gregory shows the possibility of the Red Sea depression having once been the valley of a river flowing into the Indian Ocean, and receiving near its mouth a tributary from the large lakes that formerly existed in the Rift Valley, and that may have occupied a considerable portion of what is now the upper Nile basin. This is of course, as is fully admitted, hypothesis, but it is supported by a very curious mass of data, and it explains the difficulties better than any other suggestion hitherto put forward.

One characteristic of Dr. Gregory is a taste for naming various things, past and present. In many cases this is useful, as when he maps and names the ridges and valleys of Mount Kenya. It may also be of service to have a name, like Lake Suess, for an ancient sheet of water of which evident traces remain; but it is somewhat questionable whether there is any advantage in calling the hypothetical stream, that may at some past time have traversed the Red Sea, the Erythræan river. In one case the author of the "Great Rift Valley" appears, in the application of names, to have departed from the usual practice. Geologists have generally given local names to rock-systems and their divisions, and have referred them, so far as they were able, to the geological periods, or divisions of geological time, recognised in Europe. To judge by the table at p. 235, certain names—Naivashan, Laikipian, &c.—are given to divisions of geological time rather than to rock-masses, and it is fairly open to grave

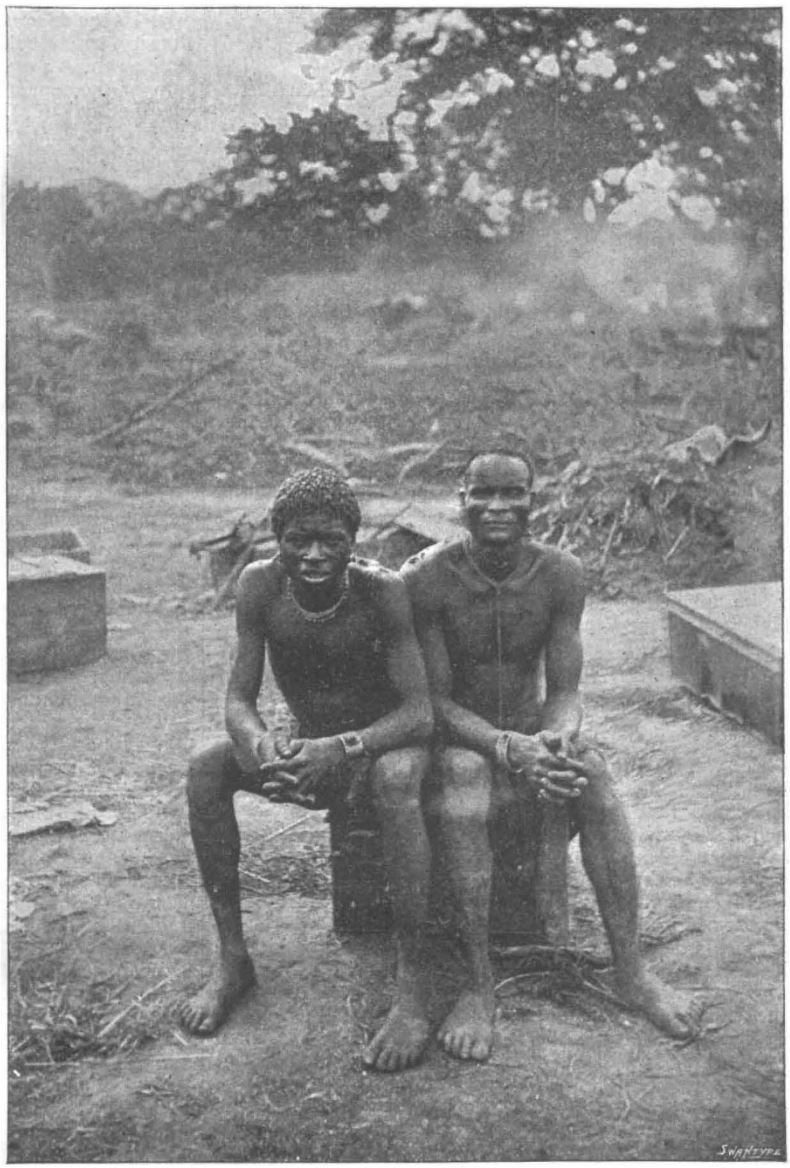

FIG. 2.—Two Wa-pokomo of the Tana.

doubt whether this is an improvement on the usual practice.

The chapters on the flora of East Africa, and those on the Zanzibari and other natives of the country, contain a large amount of information, and are thoroughly readable. The same may be said of the concluding chapter on the national movements and future prospects of British East Africa. The whole book is clearly and well written and liberally illustrated, and the author, who quotes—and quotes appositely—not only Shakespeare, Byron and Göethe, but also Carlyle, Buckle, and Rudyard Kipling, has evidently gleaned widely in literary as well as in scientific fields. W. T. BLANFORD.

THE MEETING OF THE INTERNATIONAL COMMITTEE OF THE CARTE DU CIEL.[1]

AT the fourth meeting of the International Committee of the Carte du Ciel, which took place at the Paris Observatory in May, under the presidency of M. Tisserand, the following members were present: MM. Anguiano, Bailland, Bakhuyzen, Christie, Donner, Duner, Gill, Henry (Paul), Henry (Prosper), Loewy, Rayet, Ricco, Trépied, Turner, Viniegra. There were also present at the invitation of the Permanent Committee, MM. Abney, Backlund, Bouguet de la Grye, Callandreau, Common, Cornu, Downing, Fabre, Faye, Gautier (P.), Jacoby, Knobel, Laïs, Laussedat, Newcomb, Perrotin, Scheiner, Stephan, Wolf.

Of the eighteen observatories associated for the production of the Carte du Ciel, thirteen were represented. The directors of the five other observatories, MM. Russell (Sydney), Baracchi (Melbourne), Obrecht (Santiago), Cruls (Rio Janeiro), Beuf (La Plata), were prevented from attending by great distance or by professional duties.

The following officers were elected: President, M. Tisserand; Vice-Presidents, MM. Bakhuyzen and Gill; Secretaries, MM. Donner and Trépied.

The following resolutions were adopted:—

I.—Photographic Catalogue.

1. The Committee is of opinion that the probable error of the value of the rectilinear coordinates measured on the plates should be reduced to the smallest possible limits, and that the measurements must be directed in such a way that this probable error shall never exceed 0″·20.

2. (*a*) The Committee thinks it necessary to publish the rectilinear coordinates of the photographed stars as soon as possible.

(*b*) It is desirable that this publication should include the necessary information for the conversion of the results into equatorial coordinates.

(*c*) The Committee desires that a provisional catalogue of right ascensions and declinations should be published by those observatories which have sufficient funds at their disposal.

3. Each observatory will be at liberty to choose the positions of the comparison stars in the catalogues which seem to them most suitable. For the calculation of the constants of a plate, a minimum of ten comparison stars should be adopted if possible. The adopted positions of these comparison stars will be published.

4. The question of determining whether, for the reduction of the stars to 1900, it would be advisable to adopt a uniform system of constants for the observatories, will be the subject of a subsequent discussion.

5. The Committee recommends the adoption of a uniform size of publication for all the observatories; the size should be that of the volumes of the Catalogue of the Paris Observatory.

[1] Abridged from the *Bulletin Astronomique*, July 1896.

6. The observatories will be at liberty to determine the photographic magnitudes, either by measurements or by estimation. The only condition which the Committee thinks it necessary to impose, is that the system of photographic magnitudes on which the measures or estimations depend, should allow of a precise definition, so that the different scales used in the different observatories can be reduced to a common system.

II.—The Photographic Chart.

7. Every observatory will be provided with a scale of density, which will be printed on the plates at the same time as the *réseau*, and which will permit the determination of the sensibility of each plate for luminous sources of different intensities.

Captain Abney is charged by the Committee with the construction of the scales.

8. For the construction of the chart, the second series of negatives (that is to say, those of which the centres have odd numbers for their declinations) will be made in three exposures, each lasting thirty minutes. This time of exposure may, of course, be reduced if an increase of the sensibility of the photographic plates be secured.

9. The Committee allows photogravure on copper as a means of reproducing the chart. The negatives to be exposed three times, and enlarged to twice the original size.

10. The observatories will make two positives on glass by contact, one of which will be placed in the Pavillon de Breteuil, the headquarters of the International Bureau of Weights and Measures.

11. The Committee defers till the next meeting the examination of the measures which it may be necessary to take with the object of assisting those observatories which may anticipate a difficulty in completing their programme.

The meetings of the Committee were marked with the greatest cordiality, and with the desire to carry to the end the great work undertaken in common; the decisions, prepared by special sub-Committees, were passed unanimously by the members present.

The Conference was followed by a soirée on Saturday, May 16, and by a dinner given the next day (Sunday, May 17), in the large gallery of the Observatory, at which the following were present: MM. Rambaud, Minister of Public Instruction; Bertrand and Berthelot, Permanent Secretaries of the Academy of Sciences; Cornu and Chatin, President and Vice-President of the Academy; the members of the Committee, and numerous visitors belonging to the Academy, the Bureau des Longitudes, the Council of the Observatory, and the *personnel* of the establishment. Prof. Backlund, Dr. Downing, and Prof. Newcomb, members of the Conference on fundamental stars, were also present.

NOTES.

LIEUTENANT DE GERLACHE announces that the Belgian Antarctic Expedition he has been organising for some time past will not be sufficiently advanced to start before next year.

M. EUGÈNE TISSERAND will shortly retire from the post of Director-General of Agriculture in France, after forty-six years of public service.

EXTREMELY hot weather is reported from North America. In New York, on Tuesday, the shade temperature reached 97° F. As many as 226 deaths are recorded as being directly due to this abnormally high temperature. In Chicago there were fifty-one deaths on Monday, and twenty-five on Tuesday. Hundreds of dead horses are said to be lying in the streets. The thermometer registered 96° F. at Ottawa.