India, and I trust Dr. Hunter and Mr. Phil Robinson will excuse my saying they are both wrong *re* this name.

These hill-men have histories, if we could only get at them. This I find by having traced forty-six villages (now nine or ten different clans) as being offshoots of "Sang-nu," east-south-east of Sibsagar. Twenty-five generations ago they began to spread. S. E. PEAL

Sibsagar, Assam, May 5

Atmospheric Dust

ON Thursday, April 24, showers of discoloured rain fell at Inglewood, Sandhurst, Castlemaine, Kyneton, Daylesford, and the districts adjacent, that is to say, over an area of more than 2,500 square miles in extent. The heaviest showers—called by all who were out in them "showers of mud"—occurred at 7 o'clock p.m. and near midnight. The leaves of trees and shrubs, roofs of buildings, fences, and everything on which it could rest were more or less covered with red mud. The weather at Sandhurst for some ten days prior to this occurrence had been dry, and for a long period there had been a drought in New South Wales and in many parts northward. At several places in Victoria and New South Wales violent dust-storms occurred on the morning of the 24th immediately preceding the commencement of the rain. Some of the mud, of a bronze colour, collected by Mr. Edward Hurst of Sandhurst, was found by microscopical and chemical examination to be composed of quartz, oxide of iron, and mica; some taken from the rain-gauge stand at the School of Mines was, when dried, an almost impalpable powder of a pale reddish chocolate colour. It was seen to consist of ferruginous quartz and minute particles of black oxide of iron; and a smaller quantity collected at my private meteorological observatory—about three-quarters of a mile distant—was paler in colour, and consisted of quartz (much of it iron-free), alumina, sesquioxide of iron, and white and reddish-yellow mica. A small proportion of it was attractable by the magnet. The water collected in the rain-gauges when agitated was reddish-brown in colour, and the proportion of sediment was very large, leaving no room for doubt that the dust was brought down by the rain. Its composition and the times at which it fell lead me to believe that it came from the north and had travelled far.

R. BROUGH SMYTH

School of Mines, Sandhurst, Victoria, Australia, May 1

The "Red Glow" after Sunset

BEING out on Sandymount Strand last night, whence the western sky may be well observed, I noticed, about 8.45 p.m., the "red glow" over the yellowish sky where the sun had set. It was quite as distinct as during certain evenings at the end of last year. J. P. O'REILLY

Royal College of Science for Ireland, Stephen's Green, Dublin, June 12

The Earthquake

AS communications on this subject are still being received by NATURE, and as the records for London and its immediate vicinity have been few, it occurs to me to note the following facts:—At the time of the earthquake I was sitting in my study here. There are several heavy insect-cabinets in the room, and a loud "groan" proceeded from one or more of them, indicating "settling" from some cause or other. Furthermore, the door of the room would not lock on the evening of that day, although the lock had moved freely down to then. And a clock in a bed-room was found to have stopped without any apparent cause at the hour indicated for the earthquake; but as the discovery was not made until late in the evening, it was not possible to decide whether the stoppage had occurred in the morning or evening. As no sensation was *felt*, these matters would have held no significance had it not been for the news in the evening papers of that day. R. MCLACHLAN

Clarendon Road, Lewisham, S.E., June 13

Intelligence in Animals

THERE is at Walham Green a daily illustration of intelligence in a donkey which may interest those of your readers who collect such facts. Old Bob the waterman has been known for so many years that it is impossible to say how many. He is one of the few surviving carriers who take round for sale water in a tub on wheels, which is drawn by a donkey. Bob, the tub, and the donkey are one of the institutions of Walham Green. Years ago Bob used to guide his donkey to the pump near the church and then drive him round to his customers. How long the donkey was learning his rounds I do not know. Three years ago Bob used one shaft as a sort of movable crutch, and seemed to trust much to his donkey to go the right way. Now he appears quite blind, for a few days ago he was noticed going into the yard where the pump stands, when the donkey stopped. He asked a boy what his donkey had stopped for, and was told that a cart was in the way. It is interesting to note that the donkey conducts by his own intelligence all the business of water distributor, while Bob has sunk to the condition of mere pumper and of money collector attached to and led by the shafts, which latter duty might be done by an intelligent dog. M.

ADOLPHE WURTZ AND HIS CHEMICAL WORK

BY the death of Adolphe Wurtz on May 12 last, the world, and especially the scientific world, has lost one of its brightest and most energetic leaders,—a successful leader indeed, through perhaps the most difficult period of chemical history—the earliest years of the development of our "modern chemistry." His loss is felt all the more acutely, coming as it does so suddenly and so close upon that of his master and friend, Dumas, whose mantle had fallen upon him.

Charles Adolphe Wurtz was the son of a Protestant clergyman, and was born on November 26, 1817, at Wolfsheim, near Strasburg. He studied in the University of Strasburg in the Medical Faculty, in which he took the Doctor's degree with honours in 1843. He came to Paris in 1844, where he soon attracted the attention of Dumas, and after occupying several positions successively at the École Centrale and the Faculty of Medicine he became Professor at the Institute Agronomique of Versailles, and in 1853 succeeded to the duties of Dumas and Orfila as Professor at the Faculté de Médecine.

Wurtz united in himself all the better qualities of the Gallic and Teutonic character, in his activity of mind and untiring perseverance in the search for truth. He was elected a member of the Academy of Medicine in 1856, and in 1865 was awarded the prize of 20,000 francs for his chemical researches. He became Dean of the Faculty in 1866, and Professor at the Sorbonne in 1878, in which year also he gave the Faraday Lecture at the Royal Institution; the subject of which was the condensation of gases, and his hearers on that occasion will not readily lose the impression of his earnestness and vivacity, especially on the appearance of the liquefied gas (ammonia), and his exclamation, "Voilà! voilà le liquide," &c.

His earnestness of purpose, conjoined with a most genial manner and expression, gave him very great influence over those students who worked with him; and a long list of names might be given of students who have done good service to the science under his guidance and encouragement.

But he not only encouraged the students who came to learn under him, but strove to spread a knowledge of science amongst the mass of the public, in which task he was eminently successful.

In addition to his onerous duties as professor, Wurtz was in 1881 elected permanent Senator, and rendered most valuable services to his country as recorded in his Reports of Commissions on the trichinosis outbreak and on scientific education.

While there are chemists the work and example of Adolphe Wurtz will serve as a beacon and guiding light to still wider and more important facts in our science.

The Royal Society's Catalogue of Scientific Papers contains a list of no fewer than one hundred and four papers to which the name "Adolphe Wurtz" is alone attached; of these a large proportion recite particulars of researches which have furnished results of high theoretical importance, and which entitle their author to be reckoned as one of the chief contributors to the foundation of systematic chemistry. In him French chemists lose their chief leader; but their loss is also that of the scientific world at large. His logical clearness of thought, his breadth of view, and the precision of his statements secured Wurtz an influence wherever chemistry was taught; and at the present time, overwhelmed as we are in the chaos of facts brought to light with such astounding rapidity by the labours of chemists in all parts of the world, the loss of such a master-mind, of a man possessed in so high a degree of the power of coordination, is indeed grievous. His "Introduction to Chemical Philosophy," his "History of Chemical Theory," and his "Atomic Theory," of all of which English translations have been published, afford striking illustrations of the character of his teaching, and are unsurpassed as introductions to the study of the historical development of our science.

Wurtz's first paper, published in 1842, was "On the Constitution of the Hypophosphites," and, together with another on the same subject put forward a year or so later, forms not the least important of his contributions. Hypophosphorous acid had been discovered by Dulong and afterwards examined by Heinrich Rose, but their results were not in accordance; Wurtz therefore undertook the study of the acid. He established its composition and prepared and analysed a large number of its salts, and was thereby led to the conclusion that hypophosphorous acid contained two atoms of hydrogen which could not be displaced by metals, being, in fact, a monobasic acid; he also showed that of the three atoms of hydrogen in phosphorous acid only two were displaced in the formation of salts. This research was carried out in Dumas' laboratory; it may even now serve as a model of what such work should be.

In the course of his study of the hypophosphites, Wurtz was led to make what probably was his most interesting, although not his most important, discovery: that of copper hydride, Cu_2H_2. Even at the present day, although we have reason to believe that the alkali metals and palladium and platinum form compounds with hydrogen, copper hydride is the only hydride of a metal with which we are acquainted which has anything like definite and specific properties. It is obtained by acting on copper sulphate with hypophosphorous acid as a yellow or reddish-brown precipitate, which when heated readily decomposes into hydrogen and copper, and on treatment with muriatic acid yields cuprous chloride and twice the volume of hydrogen which is obtained on merely heating it. This reaction, as Brodie first pointed out, affords an almost conclusive argument for assuming that the hydrogen molecule is compound in its nature. Berthelot having called in question the existence of cuprous hydride, Wurtz in 1880 maintained the correctness of his original statements. It is to be hoped that this remarkable compound will ere long again attract attention, as it is more than probable that it will be of service as a reducing agent; its thermo-chemical investigation may be expected to furnish important information on the affinity of hydrogen atoms for hydrogen atoms: indeed it is remarkable that it has so long escaped attention from this point of view.

Wurtz paid much attention to the investigation of the cyanogen compounds, and in studying the cyanic ethers was led in 1847-49 to make the most brilliant of his discoveries, that of the compound ammonias. These bodies were obtained by the action of alkali on cyanic ethers, just as ammonia is formed from cyanic acid. In properties they were the precise analogues of ammonia, and on this account, and on account of the manner in which they were produced, Wurtz at once regarded them as ammonias in which an atom of hydrogen is displaced by an alcohol radicle such as methyl or ethyl, thus giving rise to the idea of the ammonia type. Hofmann's discovery, a few months later, of diethylamine and triethylamine, compounds resulting from the displacement of two and three atoms of hydrogen in ammonia by ethyl, and of the method of preparing amines by the action of the alcoholic iodides on ammonia, was a fitting corollary to that of Wurtz. The combined result of these two classical researches was that chemists have ever since accounted for the properties of the organic bases generally by regarding them as derivatives of ammonia, which they all so closely resemble in chemical behaviour.

Passing over numerous investigations of minor value, we come to a paper published in 1855, "On Simple and Mixed Organic Radicles," which at that time was of great importance, and well illustrates Wurtz's method of almost invariably choosing subjects the investigation of which was of special interest as bearing on the advance of chemical theory. This paper is also memorable as con-

Adolphe Wurtz (from *La Nature*).

taining the first description of the method now so commonly employed of preparing hydrocarbons by the action of sodium on the iodides and bromides of alcohol radicles, a method which some years afterwards was applied with such success by Fittig in elucidating the constitution of the homologues of benzene. Frankland and Kolbe had maintained that the hydrocarbons of the empirical composition of the so-called alcohol radicles which they had prepared were of the same composition in the free state as in combination: for example, that the hydrocarbon obtained from ethyl iodide, C_2H_5I, was free ethyl, C_2H_5. Gerhardt, Hofmann, Laurent, Brodie, and Wurtz, however, sought to show that they should be represented by a doubled formula: that the so-called ethyl, for instance, had the composition $C_4H_{10} = 2C_2H_5$. This Frankland strenuously opposed, mainly on the ground of the complete homology of the hydrocarbons in question with hydrogen, the formula of wnich was then almost universally written H. The arguments used were chiefly of a physical character. Wurtz put an end to the controversy by introducing an argument which at once appealed to the sympathy of the chemist, by showing that, if a mixture of the iodides of two distinct radicles, such as ethyl, C_2H_5, and butyl, C_4H_9, were submitted to the action of sodium, a hydrocarbon was produced which consisted of ethyl and butyl united together. There was no reason to suppose that when a single iodide was thus treated the radicle remained free, and Wurtz showed that the physical properties of the hydrocarbons produced from single iodides were such as to prove that they were formed by the union of two similar radicles, as on no other hypothesis could they be ranged in a series with the hydrocarbons resulting from the association of two dissimilar radicles. It was a logical extension of this discovery to double the formula of free hydrogen, a step which, indeed, Brodie had already advocated, and which Frankland had clearly maintained was an essential preliminary to the doubling of the formulæ of the organic radicles. Wurtz also pointed out that the idea that the hydrogen molecule is compound must be extended to other elements, and that generally the simple bodies, like compounds, are composed of groups of atoms, and react not by combining but by exchange of elements.

The number of elements of which the molecular weight has been ascertained is, however, very small, and although the idea thus put forward by Wurtz undoubtedly applies to all the gaseous elements, and to bromine, iodine, sulphur, phosphorus, and arsenic, we now know that the only *metals* of which the density in the gaseous state has been satisfactorily determined, viz. mercury and cadmium, form distinct exceptions to the rule; we can therefore draw no conclusions of any value as regards the molecular composition of the metallic elements. It is a striking illustration of the slowness with which knowledge extends into that lower stratum which is governed by the text-books, that the view put forward by Wurtz, and which, with the above-mentioned limitation, is so clearly justified by facts, is almost universally disregarded by hand-books of chemistry; in fact, there is a most astounding superstition among students of chemistry that the elements generally have diatomic molecules.

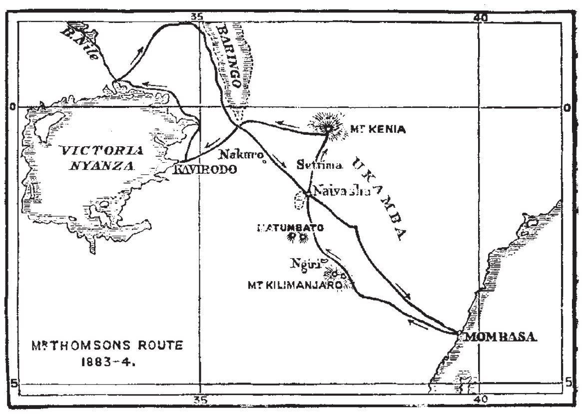
In 1855 Wurtz was led by the brilliant experimental results of Berthelot to discuss the formula of glycerin, and he was the first to point out that this body is to be referred to the type of three molecules of water; that, in fact, it can be regarded as an alcohol formed by the displacement of three atoms of hydrogen in three molecules of water by the radicle C_3H_5. Nearly all the alcohols known at that time could be referred to the type of a single molecule of water. Recognising the want of an intermediate series of alcohols, Wurtz was led in 1856 to the discovery of the glycols, and in this case again his work was of the highest value as a contribution to chemical theory.

Space does not permit of reference to the numerous other investigations of Wurtz, many of which have exercised an important influence upon chemical thought at the time of their publication. Only one must be mentioned, as it may ultimately prove to have been the first step towards the elucidation of the nature of the process of digestion in plants and animals. The investigation referred to is that on the sap of *Carica papaya*. He showed that alcohol precipitates from this a body presenting the characters of a strong digestive "ferment," capable of dissolving moist fibrin in large quantities. Experiments made with papaine, as the so-called ferment is termed, appear to show that papaine begins by combining with the "ferment," and that the insoluble product then undergoes gradual change in contact with water, the "ferment" being liberated and thus becoming free to do new work. There is much to indicate that mineral acids act in this way, and it is to be hoped that the suggestion put forward by Wurtz will not long escape notice, and that his investigation may be extended.

AFRICAN EXPLORATION

LETTERS addressed to the Secretary of the Committee of the British Association for the exploration of Kilimanjaro have just been received from Mr. H. H. Johnston, dated from the British Residency, Zanzibar, May 13. After consultation with Sir John Kirk, Mr. Johnston had selected the Mombasa route for Kilimanjaro, and was expecting to depart for that port in about a fortnight's time. The country between Mombasa and Chaga was said to be quiet, and to present no serious difficulties in the way. Mr. Johnston had succeeded in obtaining the services of three of the same bird-skinners that had been employed by Dr. Fischer, and of a botanical collector trained under Sir John Kirk, of whose kindness and assistance he speaks in the highest terms. Mr. Johnston, in spite of the trying climate of Zanzibar, was in excellent health, and had strong hopes of the success of the expedition.

We are pleased to learn that Mr. Joseph Thomson has arrived safely at Zanzibar from the expedition he undertook to the Masai region. It will be remembered that Mr. Thomson left England in the end of the year 1882, his object being to proceed by Mount Kilimanjaro to the almost unknown country of the Masai, and to settle the question of the existence of a Lake Baringo to the east of Victoria Nyanza. Mr. Thomson left Zanzibar in the



spring of last year, but after proceeding some distance found the country so disturbed owing to the recent passage of a German explorer, Dr. Fischer, that he was compelled to return precipitately to Mombasa. In July last, however, he started again, and has evidently accomplished his work in a way quite worthy of his previous record. Passing round the north-eastern side of Mount Kilimanjaro, Thomson proceeded north to Lake Naivasha, halfway between Kilimanjaro and Mount Kenia; then on to the latter mountain, and by way of Lake Baringo to the shores of Victoria Nyanza. This latter lake he skirted as far as the outlet of the Nile, returning by a more northerly route, striking the west coast of Lake Baringo, and proceeding south and south-east by Ukambani to Mombasa. It is satisfactory to record that no lives have been lost except by illness. The telegram which the Geographical Society have received from Sir John Kirk does not, of course, enter into minute details, but from its general tone it is evident that Mr. Thomson will have an interesting and instructive story to tell when he returns. The telegram does not state positively that Mr. Thomson found a lake where Baringo is placed on our maps, but as Baringo is mentioned as having been touched at, it seems most probable that the information obtained from natives by the sagacious Wakefield is correct. All the country traversed by Mr. Thomson's expedition to the north of