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.

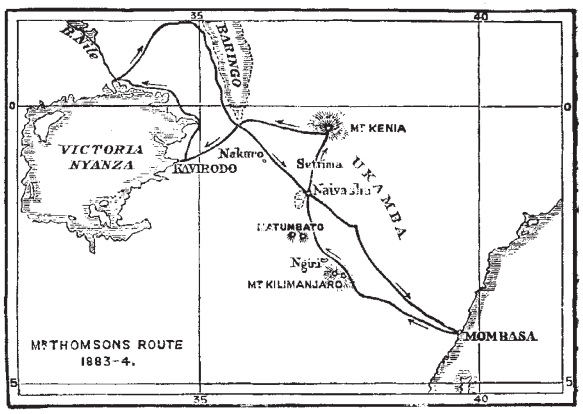
In 1855 Wurtz was led by the brilliant experimental results of Berthelot to discuss the formula of glycerin, and he was the first to point out that this body is to be referred to the type of three molecules of water; that, in fact, it can be regarded as an alcohol formed by the displacement of three 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

Lake Naivasha is new ground, hitherto untraversed by any explorer. Dr. Fischer in his recent expedition reached only as far as the lake just mentioned.

A NEW ASTRONOMICAL JOURNAL[1]

AN astronomical serial, under the auspices of the Observatory of Paris, will be a welcome addition to the literature of the science, and may well be expected to occupy a prominent place on the list of such periodicals.

Admiral Mouchez, in his introductory note, alludes to the great impetus which has been lately given in France to the progress of astronomy by the establishment or resuscitation of observatories, aided as well by national funds as by contributions from the municipal authorities of the places where they are located. In a few years these various observatories will be completely organised, the *personnel* consisting in part of astronomical students who have obtained their acquaintance with the practical branches of the science in the Observatory of Paris. The director therefore aims at providing a medium in the *Bulletin Astronomique* whereby the work of French astronomers may be speedily made known, and where at the same time an analysis of the contents of the principal foreign periodicals, &c., may be available to them.

The *Bulletin* will thus present two distinct sections: the first will be composed of observations of current interest, ephemerides of planets and comets, and memoirs or notices on various questions in theoretical and practical astronomy. The second will comprise as complete a *résumé* as possible of astronomical intelligence and an analysis of the principal periodicals and newly-published works. Further, in a supplementary section it is intended to introduce articles on subjects relating to the sciences allied to astronomy, as terrestrial physics, geodesy, and meteorology, not excluding points of interest in the history of the science: contributions from foreign astronomers are invited.

In the first four numbers of the *Bulletin* are articles bearing upon sidereal, planetary, and cometary astronomy. There is a series of measures of double-stars in 1883, made by M. Perrotin at Nice in continuation of previous series which have appeared in the *Astronomische Nachrichten*. M. Perrotin has habitually used powers of 750 and 1000: objects not too frequently measured of late will be found in his list, which is to be continued. MM. Henry have a note upon the planet Saturn as viewed in the refractor of 0·38 m. at the Observatory of Paris, in which reference is made to a narrow bright ring limited by a dark line, outside the principal division, the breadth equal to that of the division of Cassini, which they consider to be a new feature. It is stated that the Encke division has completely disappeared; notwithstanding extremely favourable atmospheric circumstances, nothing was remarked upon the outer ring except the narrow bright zone just mentioned. MM. Henry invite communications on this subject from other observers provided with large telescopes. M. Baillaud publishes observations of *Mimas* made at Toulouse between October 24, 1876, and December 5, 1883. The telescope employed has an aperture of 0·83 m., the mirror being the work of MM. Henry, the mounting by Secretan. A power of 335 was usually employed; the observations for the most part consist of the times of elongations, but during the opposition of 1882-83 M. Fabre succeeded in observing several conjunctions with the minor-axis of the ring N and S. From these observations M. Tisserand has drawn several conclusions respecting the motion of the satellite, to which he directed attention in a paper submitted to the Paris Academy of Sciences on January 28, and printed in the *Comptes Rendus*. He fixes the mean daily motion at 381°·9934, and his observations are compared with calculation on this hypothesis, the orbit being supposed circular. But he infers that there is an inequality in the mean longitude, of which the period is about five years, and the coefficient approximately 8°; further he finds that the eccentricity does not exceed one-tenth. The longitudes of the perisaturnium, deduced from observations during five periods, may be fairly represented on the assumption of an annual motion of 447°. It is intended to observe *Mimas* at Toulouse as frequently as possible, and, so far as circumstances admit, the same observer will undertake them, it having been found that observations made by different persons with the same instrument are not strictly comparable.

In the February number of the *Bulletin* M. Schulhof has the earliest notification of his discovery of the periodicity of the third comet of 1858, upon which he enters into details in the number for April; the most probable period of revolution resulting from the few observations which were secured in America (the comet was not seen in Europe) is 6·61 years, and the limits somewhat insecurely assigned are 5·80 and 7·54 years. As in other cases, this comet approaches very near to the orbit of Jupiter, to which we may attribute the limited dimensions of the orbit, according to M. Schulhof. There are several communications on Pons' comet, physical and otherwise; amongst them a note by MM. Trépied and Rambaud, of the Observatory at Algiers, on the remarkable variation in the head of the comet, observed on January 19, and one by M. Rayet on the *aigrettes*, &c., remarked near the time of perihelion passage. M. Radau treats on the theory of the heliostats, and M. Bigourdan on a means of rendering more convenient the use of the equatorial. We find also in these numbers of the *Bulletin* a description and plan of the buildings of the Observatory at Marseilles, by M. Stephan; and a list of discoveries of small planets and comets made at that establishment: amongst the latter we note that the discovery of the first comet of 1867 on January 25 is attributed to M. Coggia; at the time it was announced to have been made by M. Stephan, at least in a letter from M. Tempel, then residing at Marseilles, to the *Astronomische Nachrichten;* as Mr. Searle has shown that the comet is one of comparatively short period (thirty-three years) and may therefore want a name, it might be well to settle the point as to who was the actual discoverer. There is a note on an Observatory to be erected at La Plata, the recently founded capital of the province of Buenos Ayres; a director has been already nominated in the person of M. Beuf, an officer of the French Marine, formerly in charge of the Observatory of Toulon; 100,000 francs have been allowed for the Observatory and instruments, with an annual subsidy of 24,000 francs. Such liberal encouragement of science does honour to M. Dardo Rocha, the Governor of the Province of Buenos Ayres, and it is due to him to add that he had previously done much for recent progress in the Argentine Republic.

As a specimen of the miscellaneous articles in the *Bulletin*, we may mention M. R. Radau's interesting account of the recent crepuscular phenomena, in which he has availed himself of the numerous facts relating thereto which have been published in NATURE. He does not profess to decide upon the cause of these phenomena, or to make choice between the explanations which have been offered, but we may quote his concluding paragraph: "Ce qui semble prouvé, c'est qu'il s'agit ici, très-probablement, de phénomènes de réflexion, dus à la présence de matières finement divisées dont la nature reste à déterminer; la lumière ainsi réfléchie n'est, sans doute, que la lumière ordinaire du soleil couchant, colorée par transmission à travers les couches basses, chargées de vapeurs."

The typographical execution of the *Bulletin* leaves nothing to be desired. The March number contains a photolithograph of the aspect of Saturn as viewed at the Observatory of Paris on the 4th of that month.

[1] *Bulletin Astronomique*, publié sous les auspices de l'Observatoire de Paris, par M. F. Tisserand, &c. (Paris: Gauthier-Villars, 1884.)