the connection between the two basins were to be established, some of the most flourishing cities of the Schott region, like Tooser and Nephta, would be submerged by the floods, and most probably all the large date-tree forests of the Djerid destroyed by the change of climate and the increased moisture. Herr von Hesse Wartegg spoke at length of his travels through the Regency, and mentioned some curious meteorological and botanical observations. The traveller brought back with him a large collection of plants, ethnological objects, and insects, as well as drawings and photographs. He will exhibit his collection at his lecture before the British Association at the forthcoming Swansea meeting.

THE new number of the Geographical Society's *Proceedings* opens with the presidential address on the progress of geography, in which the chief space is devoted to the Arctic regions and Africa; it is supplemented, however, by a summary of Admiralty and Indian surveying operations. A letter is next given from Mr. James Stewart of Livingstonia to the Free Church of Scotland, furnishing a further account of his recent explorations north-west of Lake Nyassa, up to the south end of Lake Tanganyika, and which was accompanied by valuable longitude observations. The latter is illustrated by Mr. Stewart's route surveys, which are of great value from a geographical point of view. Among the notes information is given respecting Dr. Lenz' progress in North-Western Africa, which had reached the Foreign Office through the British Minister at Tangier. Dr. Lenz is stated to have crossed the Atlas, and Moorish protection being refused him beyond Terodant, he has pushed on alone towards Timbuctoo and the Soudan, disguised as a Mohammedan doctor and accompanied by a Moor named Hadj Ali. There are also interesting particulars respecting the movements of a Roman Catholic missionary expedition to the Matabele country and the Upper Zambesi region.

SIGNOR FRACCAROLI, the delegate of a society formed last year at Milan for the development of commerce with Central Africa, has lately paid a visit, in company with Emiliani Bey, to the centre of the Darfur province, which he found in a state of desolation from the recent wars. After a vain attempt to reach the summit of Jebel Si, a lofty isolated peak in the Jebel Marra, he returned to Khartum, whence he expected to proceed on a journey up the Balor el Ghazal.

COUNT LOUIS PENNAZZI is about to undertake a journey in Abyssinia and the neighbouring region. He proposes to start from Massowah and visit the city of Gondar and Mount Debra Tabor, hoping to find King John and obtain from him an escort to accompany him through the Gojam province and to the Blue Nile. Thence he will proceed in a west-south-west direction, following the Sobat and the White Nile along the eighth parallel, and eventually join Signor Gessi.

NEW METALS

WITHIN a period of about two years the chemical world has been startled by the successive announcement of the discovery of no less than fourteen[1] new elementary bodies. All of them are classed as metals, and eleven are said to belong to the yttrium or to the closely-allied cerium group. Without pausing to examine the advisability of announcing the discovery of a new element whenever an unknown reaction crops up, we purpose to give a brief account of these discoveries, and to investigate, as far as possible, what claim they may have to be honoured with a place in our lists of the chemical elements.

In July, 1877, M. Sergius Kern published[2] the discovery of a new metal belonging to the platinum groups, to which he gave the name *davyum*. The davyum was, he said, contained in the latter portions of the platinum ores precipitated by hydrogen at 100° together with the rhodium and iridium. The metals having been heated with barium chloride and chlorine in the usual manner, the rhodium and iridium were fractionally precipitated by acid sodium sulphite, and the davyum contained in the filtrate thrown down with ammonium chloride and nitrate. From this double chloride an ingot of the metal weighing 0·27 gramme was obtained. The properties of this metal and its compounds, as stated by M. Kern, all agree more or less closely with those of the other platinum metals. It is difficultly fusible, dissolves only in *aqua regia*, possesses an atomic weight of about 100, &c. Its specific gravity is, however, said to be 9·38, which is lower than that of any other metal of this group, but approximates to a mixture of rhodium with a little iron. The characteristic reaction is stated to be the red colour produced by potassium sulphocyanate, but unfortunately both iron and ruthenium produce the same result, and M. Kern does not tell us what means he has adopted to get rid of traces of these and the other platinum metals, or to convince himself that they were absent. It is to be regretted that no protest, except a letter of Mr. W. H. Allen,[1] has been raised against this endeavour to foist a "new metal" upon the chemical world, and that too by a chemist who has signallised himself by such inaccurate results in other directions.

Turning now to the recent additions to the yttrium metals, we have in the first place to notice a contribution by Marignac. In the summer of 1878, after examining the earths from gadolinite to establish the existence of terbium, this chemist was induced to attempt a further separation of the erbia obtained in the course of his experiments. These investigations led to the discovery that this pink earth contained another white earth with a somewhat higher atomic weight, and whose salts gave no absorption-spectrum. To the metal contained in this earth the name *ytterbium*[2] was given. These results have recently been fully confirmed,[3] and we may accept the existence of this metal as an established fact. Marignac gave some of his specimens to his colleague, M. Soret, to examine spectroscopically. The latter chemist, operating with sunlight and with a spectroscope of high dispersive power, found that certain lines in their absorption-spectra did not agree with those of erbia, and that this was particularly the case with regard to the violet and ultra-violet portions of the spectra. From these results he was led to suspect the presence of two new earths, one of which he named provisionally X, leaving the other unnamed.[4] All attempts to separate either of these earths were, however, futile.

Shortly afterwards Lawrence Smith published[5] the results of some investigations on these earths obtained from the mineral samarskite, abundant in North Carolina and other American localities, instead of from gadolinite. As the result of his investigations he announced the discovery of a new earth, to which, however, he gave no name. It was, he said, a yellow earth possessing most of the properties of terbia, but differing from it in some reactions. Marignac, who received a sample of this earth, found,[6] on examining it, that its properties did not differ appreciably from those of terbia, and we may very well accept the verdict of this distinguished chemist. Lawrence Smith also stated that the earth called X by Soret had been discovered by him in samarskite about a year previously, and had been named *mosandrum*. He has since admitted[7] that the salts of this metal give no absorption-spectrum, and he has furnished us with no details as its special properties, mode of separation, &c., which are conclusive enough to admit of its immediate recognition as a new metal.

We now come to a number of "new" metals all belonging to the same group, and mainly distinguished by slight differences in the absorption-spectra of their salts and in their atomic weights. The earth named X by M. Soret, as well as the one he left unnamed, have been already referred to. Besides these, two new metals have been announced by M. Delafontaine,[8] which he has named *phillipium* and *decipium*. The former is a yellow earth with an equivalent between that of yttria and terbia, the latter a white earth with a higher equivalent; both possess indistinct absorption-spectra. M. Soret, who has examined the absorption-spectra very carefully, thinks it probable[9] that the mixture formerly known as erbia may contain phillipia or his unnamed earth, together with the earth X and the real erbia, besides other earths giving no absorption-spectra. Of decipium we have no confirmation. These earths have also been investigated by Cleve, in conjunction with Thalén. They came to the conclusion that there are three distinct earths which yield absorption spectra in the old erbia.[10] These they named *thulium*, *holmium*, and the real *erbium*. Subsequently they have admitted[11]

[1] M. Lecoq de Boisbaudran's *gallium*, the existence of which has now been fully established, is not included in this number.

[2] *Chemical News*, vol. xxxvi. p. 4.

[1] *Chemical News*, vol. xxxvi. p. 33.

[2] *Arch. des Sci., phys. et nat.*, vol. lxiv. p. 101.

[3] Nilson, *Ber. d. deut. ch. Gesell.*, v. xii., p. 550; Humpidge, Brit. Ass. Reports for 1879; Lecoq de Boisbaudran, *Comp. Rend.*, vol. lxxxviii. p. 1342.

[4] *Arch. des Sci., phys. et nat.*, vol. lxiii. p. 99.

[5] *Comp. Rend.*, vol. lxxxvii. p. 146.

[6] *Arch. des Sci., phys. et nat.*, vol. lxiii. p. 172.

[7] *Comp. Rend.*, vol. lxxxix p. 478.

[8] *Comp. Rend.*, vol. lxxxvii. pp. 559, 632.

[9] *Arch. des Sci., phys. et nat.*, vol. lxiii. p. 99.

[10] *Comp. Rend.*, vol. lxxxix. p. 478.

[11] *Ibid.*, vol. lxxxix. p. 708.

that M. Soret has priority in the discovery of these new earths, since the absorption-spectrum of holmium coincides exactly with that of the earth X., and thulium is probably the same as the unnamed earth of Soret or the phillipium of Delafontaine. The existence of these three earths in the yttria group is also acknowledged to some extent by Marignac;[1] it may therefore be considered tolerably certain that these new earths are really contained in this group, whatever names they may ultimately receive. In connection with this we must not omit to mention the investigations of M. Lecocq de Boisbaudran. He has confirmed[2] the results of MM. Soret and Cleve concerning the three earths mentioned above, and even thinks that he has obtained sufficient evidence of a fourth, named *samarium*. He admits, however, that its separation is too tedious to allow of its extraction in a state approaching purity.

In operating upon the mixture of earths formerly known as erbia Nilson was able to separate, besides the earths giving absorption-spectra and besides ytterbia, another white earth, whose salts gave no spectrum and which possessed a low atomic weight (about 45). The new metal contained in this earth he named *scandium*,[3] and he states that it is distinguished by a special spark-spectrum. These results have been confirmed by Cleve,[4] and he has remarked that many of the properties of this scandium agree closely with the metal whose existence was predicted by Mendelef under the name of *ekabor*.

The following are a few of the more striking of these resemblances:—

Ekabor	Scandium
At. wt. = 44	At. wt. = 45
Only oxide = Eb_2O_3	Only oxide = Sc_2O_3

The oxide is white, infusible, and nearly allied to yttria.

S.G. of oxide = 3·5	S.G. of oxide = 3·8

On the other hand it is difficult to understand how a metal with such a low atomic weight could remain associated with others possessing atomic weights three or four times as great throughout the long process of fractional separation. According to all analogy with yttrium, terbium, and erbium, it ought to remain with the first of these. The following table of the metals of the yttrium group will illustrate the present state of our knowledge with regard to them. The atomic weights are calculated on the supposition that their oxides are of the general formula M_2O_3—those in italics give distinct absorption-spectra:—[5]

	Scandium (?)	Sc = 45	(Nilson)
	Yttrium ...	Y = 89	Bunsen and Cleve)
Probably identical	*Phillipium*	Pp = 111	(Delafontaine)
	Unnamed metal of Soret ...		Undetermined
	Thulium		
Probably identical	*X. of Soret*		
	Holmium		
	Terbium ...	Tr = 147	(Marignac)
Probably identical	*Samarium* (?)		Undetermined
	Decipium (?)	Dp = 159	(Delafontaine)
	Yβ	= 149·4	(Marignac)
	Yα	= 156·7	(Marignac)
	Erbium ...	Er	Undetermined
	Ytterbium ...	Yb = 172	(Marignac)

It must also be remarked that Delafontaine has suspected that the didymia obtained from cerite differs from that from samarskite, although Lecoq de Boisbaudran and L. Smith have since shown that the absorption-spectrum of the didymia salts may be considerably altered by making the solutions strongly acid, &c. And it is of course open to question whether some of the spectroscopic differences ascribed to different metals may not be due to differences in the concentration, acidity, &c., of the solutions employed.

It only remains to mention the newly-discovered metals—*norwegium* and *vesbium*. The former was announced to English chemists some twelve months ago by Dr. T. Dahll.[6] It is, he says, a white metal, allied to copper in many of its properties, but with a melting-point of about 350° C., and a specific gravity of about 9·4. Its atomic weight would lie between 141·6 and 150·6. The latter metal (vesbium) has been stated by M. A. Scacchi to be present in a green incrustation found on Vesuvius in the fissures of the eruption of 1631. It is, he says, present in the shape of a red metallic acid, giving colourless salts with the alkalies. Many of its properties agree with those of molybdenum or vanadium, particularly the latter, though M. Scacchi believes that both these metals are absent. Of numerical data only the proportion of silver in the silver salt is given. This is stated to be 48·8, while for the corresponding vanadium salt it would be 52·1, a coincidence too close to be disregarded.[1] Up to the present we are without any confirmation of the existence of these two metals, and we cannot do otherwise than suspend judgment on them for a time.

Indeed the scepticism which the chemist, in common with other scientific men, ought to practise cannot be too strongly insisted upon. No discovery of such importance as that of a new element should be generally accepted until it has been submitted to a series of rigorous confirmatory tests. It is obviously so much better to defer definite judgment until sufficient facts have been collected than to accept a hasty conclusion, probably based only upon one or two anomalous reactions. How often it happens that the chemist describes a reaction not as he saw it, but as he thought he saw it, or as he hoped to see it! Even in cases where the reaction possesses some peculiarity too little attention is often paid to the effects which even traces of other substances may produce, or to any extraordinary conditions under which the experiment may be made, and the chemist at once imagines that he has discovered a "new element." Time alone will prove how many of the fourteen substances enumerated above will pass the ordeal of further and perhaps more rigorous investigations.

T. S. HUMPIDGE

Since writing the above M. Marignac has published an account of some investigations on the earths contained in samarskite.[2] He divides these earths into four groups, according to their solubility, in a saturated solution of potassium sulphate:—

(i.) Those earths soluble in less than 100 parts of the solution.
(ii.) Those soluble in 100 to 200 parts.
(iii.) Those only slightly soluble.
(iv.) Those insoluble.

Group (i.) contains only well-known earths, and particularly yttria and terbia. Their equivalent was always below 119 (oxide = MO). Group (ii.) consists of earths with an equivalent between 119 and 115. It contains traces of the preceding and following groups, but principally consists of a pale yellow earth with an equivalent of about 120·5, and without any absorption spectrum. This earth he provisionally calls Yα; its properties do not agree with those of any of the others of this group mentioned above. Group (iii.) contains a considerable quantity of terbia and didymia, together with a colourless earth yielding an absorption-spectrum agreeing with that of Delafontaine's decipia, or better with that of Lecoq de Boisbaudran's samaria. This earth he calls Yβ, and he is of opinion that decipia, samaria, and Yβ are practically one and the same earth. The equivalent he makes 115·6 (oxide = MO), which would give an atomic weight of 149·4 (oxide M_2O_3). Group (iv.) consists principally of didymia, together with considerable portions of the other earths, which it is almost impossible to completely separate.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—At Trinity College one Millard Scholarship, tenable for four years during residence, and of the annual value of 80*l.* without limit of age, will be awarded in October next for proficiency in natural science if any candidate of sufficient merit offers himself. The subjects of examination will be chemistry and physics. Candidates may also offer mathematics, if they wish to do so, and give notice a week before the examination. Special weight will be attached to excellence in one or two subjects, rather than to a less thorough knowledge of all. The scholar elected will not necessarily be required to commence residence immediately. The same papers will be set in chemistry and physics as in the examination for the Natural Science Scholarship at Exeter College. Every candidate will be considered as standing at both colleges, unless he makes a statement to the contrary on entering his name. Candidates are requested to state which college they would prefer in the event of their being elected at both colleges. The president will receive the names of candidates, and their testimonials of character, on Wednesday, October 13, between 8 and 9 p.m.

[1] *Arch. des Sci., phys. et nat.* (*loc. cit.*).
[2] *Comp. Rend.*, vol. lxxxix, pp. 212 and 516.
[3] *Ibid.*, vol. lxxxviii. p. 645. [4] *Comp. Rend.*, vol. lxxxix. p. 419.
[5] Lawrence Smith's *Mosandrum* is not included in this list, since its existence is so improbable.
[6] *Chem. News*, vol. xl. p. 25.

[1] *Ber. d. deut. ch. Gesell.*, vol. xiii. p. 250; NATURE, vol. xxi. p. 420.
[2] *Compt. Rend.* vol. xc., p. 899.