where there was not excessive moisture, might retain their germinative power for an almost indefinite period; and the fact that plants previously unknown in a locality often spring up where excavations have been made, bear out this assumption. The same thing happens in arable land, should the farmer plough deeper than usual; and deeper tillage, which would otherwise be beneficial, is often avoided on this account. A careful writer like Lindley states, though without qualification, that he had raspberry plants raised from seed taken from the stomach of a man, whose skeleton was found thirty feet below the surface of the ground. Judging from coins found at the same place, the seeds were probably 1600 or 1700 years old. One more example of seeds germinating that are supposed to have been buried some 1500 to 2000 years. About twenty years ago, on the removal of a quantity of slack of the ancient silver mines of Greece, several plants sprang up in abundance previously unknown in the locality. Among these was a species of *Glaucium*, which was even described as new; and it is suggested that the seed may have lain dormant for the long period indicated. But there is not the amount of certainty about any of these assumed very old seeds to convince the sceptical or to establish a fact. It remains yet for somebody to institute and carry out careful investigations where excavations are being made.

W. BOTTING HEMSLEY.

TERRESTRIAL HELIUM (?).

AT the meeting of the Royal Society on Thursday last (April 25), two papers dealing with the nature of the gas from uraninite were presented. We print both papers in full.

ON A GAS SHOWING THE SPECTRUM OF HELIUM, THE REPUTED CAUSE OF D_3, ONE OF THE LINES IN THE SPECTRUM OF THE SUN'S CHROMOSPHERE.[1]

In the course of investigations on argon, some clue was sought for, which would lead to the selection of one out of the almost innumerable compounds with which chemists are acquainted, with which to attempt to induce argon to combine. A paper by W. F. Hillebrand, "On the Occurrence of Nitrogen in Uraninite, &c." (*Bulletin of the U.S. Geological Survey*, No. 78, p. 43), to which Mr. Miers kindly directed my attention, gave the desired clue. In spite of Hillebrand's positive proof that the gas he obtained by boiling various samples of uraninite with weak sulphuric acid was nitrogen (p. 55)—such as formation of ammonia on sparking with hydrogen, analysis of the platinichloride, vacuum-tube spectrum, &c.—I was sceptical enough to doubt that any compound of nitrogen, when boiled with acid, would yield free nitrogen. The result has justified the scepticism.

The mineral employed was cleveite, essentially a uranate of lead, containing rare earths. On boiling with weak sulphuric acid, a considerable quantity of gas was evolved. It was sparked with oxygen over soda, so as to free it from nitrogen and all known gaseous bodies except argon; there was but little contraction; the nitrogen removed may well have been introduced from air during this preliminary experiment. The gas was transferred over mercury, and the oxygen absorbed by potassium pyrogallate; the gas was removed, washed with a trace of boiled water, and dried by admitting a little sulphuric acid into the tube containing it, which stood over mercury. The total amount was some 20 c.c.

Several vacuum-tubes were filled with this gas, and the spectrum was examined, the spectrum of argon being thrown simultaneously into the spectroscope. It was at once evident that a new gas was present along with argon.

Fortunately, the argon-tube was one which had been made to try whether magnesium-poles would free the argon from all traces of nitrogen. This it did; but hydrogen was evolved from the magnesium, so that its spectrum was distinctly visible. Moreover, magnesium usually contains sodium, and the D line was also visible, though faintly, in the argon-tube. The gas from cleveite also showed hydrogen lines dimly, probably through not having been filled with completely dried gas.

On comparing the two spectra, I noticed at once that while the hydrogen and argon lines in both tubes accurately coincided, a brilliant line in the yellow, in the cleveite gas, was nearly *but* not *quite* coincident with the sodium line D of the argon-tube.

Mr. Crookes was so kind as to measure the wave-length of this remarkably brilliant yellow line. It is 587·49 millionths of a millimetre, and is exactly coincident with the line D_3 in the solar chromosphere, attributed to the solar element which has been named *helium*.

Mr. Crookes has kindly consented to make accurate measurements of the position of the lines in this spectrum, which he will publish, and I have placed at his disposal tubes containing the gas. I shall therefore here give only a general account of the appearance of the spectrum.

While the light emitted from a Plücker's tube charged with argon is bright crimson, when a strong current is passed through it, the light from the helium-tube is brilliant golden yellow. With a feeble current the argon-tube shows a blue-violet light, the helium-tube a steely blue, and the yellow line is barely visible in the spectroscope. It appears to require a high temperature therefore to cause it to appear with full brilliancy, and it may be supposed to be part of the high-temperature spectrum of helium.

The following table gives a qualitative comparison of the spectra in the argon[1] and in the helium-tubes.

	Argon-tube.	*Helium-tube.*	
Red ...	1st triplet.	1st triplet.	Equal in intensity.
	2nd pair.	2nd pair.	,, ,,
	Faint line.	Faint line.	,, ,,
	Stronger line.	Stronger line.	,, ,,
	Brilliant line.	Dull line.	Weak in helium.
	Strong line.	Very dim line.	
Red-orange	Moderate Line.	Moderate line.	Equal in intensity.
	,, ,,	,, ,,	,, ,,
	,, ,,	,, ,,	,, ,,
Orange	Faint line.	Faint line.	,, ,,
	Triplet.	Triplet.	,, ,,
Orange-yellow	Pair.	Pair.	,, ,,
			,, ,,
Yellow	Absent.	Brilliant.	W = 587·49 (the helium line, D_3).
Green	7 lines.	7 lines.	Equal in intensity.
Green-blue	5 lines.	5 lines.	,, ,,
	Absent.	Faint.	In helium only.
	Absent.	Brilliant.	,, ,,
Blue ...	Absent.	8 lines.	,, ,,
Blue-violet	3 lines, strong.	Barely visible, if indeed present at all.	
	2, fairly strong.	2, fairly strong.	Equal in intensity.
Violet	Absent.	Bright line.	In helium only
	Absent.	4 bright lines.	
	Violet pair.	Violet pair.	Equal in intensity.
	Single line.	Single line.	,, ,,
	Triplet.	Triplet.	,, ,,
	Triplet.	Triplet.	,, ,,
	Pair.	Pair.	,, ,,

It is to be noticed that argon is present in the helium-tube, and by the use of two coils the spectra could be made of equal intensity. But there are sixteen easily visible lines present in the helium-tube only, of which one is the magnificent yellow, *and there are two red lines strong in argon and three violet lines strong in argon, but barely visible and doubtful in the helium-tube.* This would imply that atmospheric argon contains a gas absent from the argon in the helium-tube. It may be that this gas is the cause of the high density of argon, which would place its atomic weight higher than that of potassium.

It is idle to speculate on the properties of helium at such an early stage in the investigation; but I am now preparing fairly large quantities of the mixture, and hope to be able before long to give data respecting the density of the mixture, and to attempt the separation of argon from helium.

[1] Preliminary Note, by Prof. William Ramsay, F.R.S.

[1] The tube then used was the one with which Mr. Crookes' measurements of the argon spectrum were made. It contains absolutely pure atmospheric argon.

ON THE NEW GAS OBTAINED FROM URANINITE.[1]

ON March 28, Prof. Ramsay was so good as to send me a tube containing a new gas obtained by him from uraninite (cleveite) showing a line in the yellow which was stated to be of the same wave-length as D_3 which I had discovered in 1868. This line Dr. Frankland and myself shortly afterwards suggested might be a line of hydrogen not visible under laboratory conditions, but solar work subsequently showed that this view was untenable, although the gas which produced it was certainly associated with hydrogen.

Subsequently other chromospheric lines were found to vary with the yellow line, and the hypothetical gas which gave rise to them was provisionally named helium, to differentiate it from hydrogen.

It was therefore of great interest to me to learn whether the new gas was veritably that which was responsible for the solar phenomena in question; and I am anxious to tender my best thanks to Prof. Ramsay for sending the tube to enable me to form an opinion on this matter. Unfortunately it had been used before I received it, and the glass was so blackened that the light was invisible in a spectroscope of sufficient dispersion to decide the question.

On March 29, therefore, as Prof. Ramsay was absent from England, in order not to lose time, I determined to see whether the gas which had been obtained by chemical processes would come over by heating in vacuo, after the manner described by me to the Society in 1879, and Mr. L. Fletcher was kind enough to give me some particles of uraninite (Bröggerite) to enable me to make the experiment.

This I did on March 30, and it succeeded; the gas giving the yellow line came over associated with hydrogen in good quantity.

I have since obtained photographs of the gas, both in vacuum tubes while the Sprengel pump has been going; and at atmospheric pressure over mercury. To-day I limit myself to exhibiting two of these photographs.

One of the photographs exhibits a series of spectra taken during the action of the pump. The two lower spectra indicate the introduction of air by a leak, after the capillary had cracked near one of the platinums, giving us on the same plate the banded and line spectrum of air. These prove that there was no air present in the tube when the fourth spectrum was taken. This photograph has not yet been finally reduced, but a preliminary examination has indicated that most of the lines are due to the structure spectrum of hydrogen, but not all of them.

Among the lines which cannot be referred to this origin are two respectively near λ 4471, and λ 4302, which have been observed in the chromosphere, 4471 being as important as D_3 itself from the theoretical point of view to students of solar physics.

Whilst spectrum No. 4 was being photographed with the capillary tube end-on-wise, eye observations were made in another spectroscope directed sideways at it. I give from the Laboratory Note Book the observations I made while photograph No. 4 was being taken, to show that the yellow line was visible during the whole exposure.

Thursday, April 4, 1895. *Plate F. Exposure* 4.

10 minutes exposure.

4.42	Exposure started.
4.43	Yellow line brightening up considerably.
4.44	Suddenly as bright as hydrogen.
4.45	Yellow line double.
4.46	Comparison with D gives yellow line in position of D_3.
4.47	Pump much less full, 7 c.c. of gas collected. Yellow line much brighter.
4.48	Air break introduced. Line still visible, but very faint. Hydrogen lines getting brighter, and some double lines appearing in green.
4-48.5	Air break and jar removed. Yellow line the only one seen, being as bright as C. Line in green the only other line visible.
4.50	Replaced jar. Yellow brightening and the other lines more refrangible, brightening with it.
4.51	Very bright. Steeple nearly full of gas.
4.52	

The lines which appear both in the photographs of the capillary tube and of the gas collected over mercury are as follows. The lines indicated by an asterisk are near lines recorded in the chromosphere by Young or myself, or photographed during the eclipse of 1893:—

Micrometer reading.	Wave-length (Rowland).
3·2495	4581*
·2917	4523*
·2981	4513*
·3234	4479
·3316	4469·5*
·4146	4368
·5740	4196*
·5884	4181
·5933	4177*
·6139	4156*
·6176	4152·5*
·6262	4144*
·6290	4141

With regard to the observations in the visual spectrum, I have not found the uraninite gas to contain the argon lines as given by Mr. Crookes, nor, with the exception of the yellow line, do I get the special lines noted by him in the gas. (Four of these, out of six, seem possibly to be due to nitrogen.)

But I do get lines nearly coinciding with chromospheric lines discovered by me in 1868.

On November 6 of that year I suspected a line less refrangible than C, and so near it that when both were showing brilliantly the pair appeared double, like D in a spectroscope of moderate dispersive power.

Later I discovered another line at 6678·3 (R), which was observed to vary with D_3. There is a line in this position, with the dispersion employed, in the spectrum of the new gas. This line has also been seen by Thalén, as stated by Prof. Cleve in a communication to the Paris Academy (*Comptes rendus*. April 16, p. 835); but the other lines given by him (with the possible exception of the one at 5016), have not been recorded by me.

Although I have at present been unable to make final comparisons with the chromospheric lines, the evidence so far obtained certainly lends great weight to the conclusion that the new gas is one effective in producing some of them, and it is suggested by the photographs that the structure lines of hydrogen may be responsible for others.

I may state, under reserve, that I have already obtained evidence that the method I have indicated may ultimately provide us with other new gases the lines of which are also associated with those of the chromosphere.

Messrs. Fowler, Baxandall, Shackleton and Butler assisted at various times in the investigation.

[1] Preliminary Note, by J. Norman Lockyer, C.B., F.R.S.

NOTES.

WE regret to report that Prof. Huxley is still in a critical state of health. The slight improvement noticed in his condition last week appears not to have been maintained. It is more than eight weeks since his illness began with an attack of influenza, from the effects of which he is now suffering.

M. NORDENSKIÖLD has recently discovered a uranium containing mineral which may prove of great interest at the present time. It forms carbonaceous beds of which the ashes contain two to three per cent. of uranium, and, in addition, traces of nickel and rare earths. This uraniferous material is said to yield a considerable quantity of *nitrogen*.

DR. RICHARD HANITSCH has been appointed Curator of the Raffles Museum at Singapore. Dr. Hanitsch has occupied for some years the post of Demonstrator of Zoology in University College, Liverpool, and is the author of a number of useful papers on the British Sponges.

THE third centenary of Christian Huygens will shortly be reached; for that celebrated Dutch physicist, astronomer, and mathematician died at the Hague on June 8, 1695. His investigations have been reviewed at length in these columns during recent years, and *Die Natur* for April 21 contains a notice concerning them.