planet's centre was 24″·4. Prof. Schaeberle now somewhat reluctantly publishes these facts in connection with his measures of the known satellite, as he has not on any subsequent occasion been able to detect any object in the neighbourhood of Neptune in apparent orbital motion about the planet. The unusual clearness and steadiness of the night of September 24, 1892, however, is not considered to have been equalled in the later observations.

PROFESSOR MENDELÉEFF ON ARGON.

AT the meeting of the Russian Chemical Society, on March 14, Prof. Mendeléeff made some interesting remarks on the relations of argon to the periodic system. His views are summed up as follows in a proof-issue of the *Proceedings* of the Society:—

"As regards argon we must consider, first, whether it is a chemical individual, or a mixture, and then, whether it is a simple or a compound body. The supposition that it be a mixture, lies beyond all probabilities; it is contradicted by the researches of Olszewski into the liquefaction and solidification of argon. The supposition that it may be a compound has also little in its favour. The remarkable inactivity of argon testifies in favour of its being a simple body, although there are, of course, some compounds, also endowed with the same property to some extent. The spectrum of argon, too, is characteristic of a simple body.

"Taking it as a simple body, we must then consider its possible atomic weight, the weight of its molecule being near to 40 (although, probably, a little over 40, because of a slight mixture of nitrogen with the argon). The atomic weight of argon evidently depends upon the number of atoms which its molecule contains. We must, therefore, consider the series of possible molecular formulæ: A, A_2, A_3, . . . A_n.

"Upon the first supposition, A, the atomic weight of argon would be about 40, and, like cadmium and mercury, it would be a monatomic gas.

"In favour of this supposition we have the specific heat ratio at constant volumes and pressures, K, found by Rayleigh and Ramsay to be near to 1·66, *i.e.* to the value which is considered as characteristic for monovalent gases. It must, however, be borne in mind that K varies for compound molecules, even when these last contain the same numbers of atoms; thus, for most bivalent gases (nitrogen, oxygen, &c.) K is near to 1·4, while for chlorine it is 1·3. This last figure makes one think that K depends not only upon the number of atoms in the molecule, but also upon chemical energy, that is, upon the stock of internal motion which determines the chemical activity of a body, and the quantity of which must be relatively great with chlorine. If, with the chemically-active chlorine, K is notably less than 1·4, we may admit that for the inactive argon it is much more than 1·4, even though the molecule of argon may contain two or more atoms.

"If we admit that the molecule of argon contains but one atom, there is no room for it in the periodic system; because, even if we suppose that its density is much below 20 (although this is very unlikely to be the case, and the contrary could rather be surmised), and that the atomic weight of argon should fall between the atomic weights of chlorine and potassium, the new body ought to be placed in the eighth group of the third series; but the existence of an eighth group in this series could hardly be admitted. In fact, an eighth group is characteristic of the large periods; and it establishes a link between the metallic elements of the seventh groups of the even series, with the metallic elements akin to them, of the first groups of the uneven series. It appears, therefore, very unlikely that the atomic weight of argon might be about 40.

"Upon the second supposition (A_2), its atomic weight would be about 20, and in such a case argon would find its place in the eighth group of the second series, *i.e.* after fluorine. But the same objections as above could then be raised. Fluorine and sodium are, moreover, strikingly unlike to each other. However, it must be said in favour of this hypothesis that it would have the advantages of analogy, by giving a new eighth group to an even series. If we take also into consideration that the typical series are possessed of several peculiarities, we may be justified, to some extent, in supposing that the atomic weight of argon is 20, this hypothesis being already much more probable than the former (A = 40).

"If we suppose, further, that the molecule of argon contains three atoms, its atomic weight would be about 14, and in such case we might consider argon as condensed nitrogen, N_3. There is much to be said in favour of this last hypothesis. First of all, the concurrent existence of nitrogen and argon in nature; then, the fact that many of the bright lines of the two spectra are very near to each other. Then, again, the inactivity of argon would be easily explained, if it originates from nitrogen, N_3, with giving up heat. And finally, the fact of its having been obtained, though in a relatively small quantity, from artificially obtained nitrogen. The supposition of Rayleigh and Ramsay, according to which argon has been disengaged in this last case from water, is very probable, but at any rate it is not yet proved. The hypothesis of argon being condensed nitrogen might be tested by means of introducing boron, or titanium, into an atmosphere of argon, strongly heated, and through which electric sparks would be passed.

"If we suppose, next, that the molecule of argon contains four or five atoms, its atomic weight will be 10, or 8, and in such case there is no room for argon in the periodic system.

"And finally, if we admit that its molecule contains six atoms, and that its atomic weight is 6·5, we must place it in the first series. In such case, it would probably take its place in the fifth group. Accordingly, the suppositions that argon is condensed nitrogen, N_3, or that, containing six atoms in the molecule, its place is in the first series of the system, appear to be the more probable ones, if it is a pure simple chemical body.

"From a letter received by D. I. Mendeléeff from Prof. Ramsay, it appears that the investigation of argon is being continued, and that the body finds its place in the periodic system; but the ultimate results of the researches of the two authors, who have brought before chemistry such an important new problem, and given it such an exemplary investigation, are not yet known."

TERRESTRIAL HELIUM (?).

WE referred last week to Prof. Ramsay's discovery of another new gas obtained from cleveite. The following papers, by Prof. Ramsay and Mr. Crookes, on this subject were communicated to the Chemical Society at its anniversary meeting.

Prof. Ramsay's paper was as follows:—

In seeking a clue to compounds of argon, I was led to repeat experiments of Hillebrand on clèveite, which, as is known, when boiled with weak sulphuric acid, gives off a gas hitherto supposed to be nitrogen. This gas proved to be almost free from nitrogen; its spectrum in a Plücker's tube showed all the prominent argon lines, and, in addition, a brilliant line close to, but not coinciding with, the D lines of sodium. There are, moreover, a number of other lines, of which one in the green-blue is especially prominent. Atmospheric argon shows, besides, three lines in the violet which are not to be seen, or, if present, are excessively feeble, in the spectrum of the gas from clèveite. This suggests that atmospheric argon contains, be sides argon, some other gas which has as yet not been separated, and which may possibly account for the anomalous position of argon in its numerical relations with other elements.

Not having a spectroscope with which accurate measurements can be made, I sent a tube of the gas to Mr. Crookes, who has identified the yellow line with that of the solar element to which the name "Helium" has been given. He has kindly undertaken to make an exhaustive study of its spectrum.

I have obtained a considerable quantity of this mixture, and hope soon to be able to report concerning its properties. A determination of its density promises to be of great interest.

The spectrum of the gas was next discussed by Mr. Crookes, who said

By the kindness of Prof. Ramsay I have been enabled to examine spectroscopically two Plücker tubes filled with some of the gas obtained from the rare mineral clèveite.[1] The nitrogen had been removed by "sparking." On looking at the spectrum, by far the most prominent line was seen to be a brilliant yellow one apparently occupying the position of the sodium lines.

[1] Clèveite is a variety of uraninite, chiefly a uranate of uranyle, lead, and the rare earths. It contains about 13 per cent. of the rare earths, and about 2·5 per cent. of a gas said to be nitrogen.