I. The Fraunhofer line on the solar spectrum, named *h* by Ångström, which is due to the absorption of hydrogen, is not visible in the tubes we employ with low battery and Leyden-jar power; it may be looked upon therefore as an indication of relatively high temperature. As the line in question has been reversed by one of us in the spectrum of the chromosphere, it follows that the chromosphere, when cool enough to absorb, is still of a relatively high temperature.

II. Under certain conditions of temperature and pressure, the very complicated spectrum of hydrogen is reduced in our instrument *to one line in the green* corresponding to F in the solar spectrum.

III. The equally complicated spectrum of nitrogen is similarly reducible to one bright line in the green, with traces of other more refrangible faint lines.

IV. From a mixture of the two gases we have obtained a combination of the spectra in question, the relative brilliancy of the two bright green lines varying with the amount of each gas present in the mixture.

V. By removing the experimental tube a little further away from the slit of the spectroscope, the combined spectra referred to in II. & III. were reduced to the two bright lines.

VI. By reducing the temperature all spectroscopic evidence of the nitrogen vanished; and by increasing it, many new nitrogen-lines make their appearance, the hydrogen-line always remaining visible.

The bearing of these latter observations on those made on the nebulæ by Mr. Huggins, Father Secchi, and Lord Rosse is at once obvious. The visibility of a single line of nitrogen has been taken by Mr. Huggins to indicate possibly, first, "a form of matter more elementary than nitrogen, and which our analysis has not yet enabled us to detect *, and then, secondly, "a power of extinction existing in cosmical space" †.

Our experiments on the gases themselves show not only that such assumptions are unnecessary, but that spectrum analysis here presents us with a means of largely increasing our knowledge of the physical constitution of these heavenly bodies.

Already we can gather that the temperature of the nebulæ is lower than that of our sun, and that their tenuity is excessive; it is also a question whether the continuous spectrum observed in some cases may not be due to gaseous compression.

## II. "On the Molar Teeth, lower Jaw, of *Macrauchenia patachonica*, Ow." By Professor Owen, F.R.S. Received April 21, 1869.

(Abstract.)

The intraneural course of the vertebral arteries is limited, in the class *Mammalia*, to the Ungulate Series, and is present in very few of these. Of

* Phil. Trans. 1864, p. 444.

† Ibid. 1868, p. 544.

existing species it characterizes the *Camelidæ*, occurring also, as shown in *Palauchenia*, in the fossil form of that family; but this rare disposition of the vertebral arteries was likewise met with in a large fossil Ungulate of South America, *Macrauchenia*, belonging to the Perissodactyle group*.

The author therefore communicates, as an appendix to his former paper on *Palauchenia*, a description, with drawings, of the mandibular dentition of *Macrauchenia patachonicha*, of the natural size, the lower jaw of that fossil animal being still a unique specimen in the British Museum. It displays the entire molar series, with the exception of the first small premolar: the several teeth in place are described in detail and compared with those of other Perissodactyles. The grinding-surface of the true molars presents the bilobed or bicrescentic type, as in *Palæotherium* and *Rhinoceros*; but *Macrauchenia* differs from both those genera in the limitation of the assumption of the molar type to the last premolar, the antecedent ones retaining the single-lobed crown. From *Palæotherium* it further differs in the last molar being bilobed, as in *Rhinoceros*, not trilobed. In *Palauchenia* all the premolars have the simpler structure, as in Artiodactyles generally. *Macrauchenia* resembles *Anoplotherium* and *Dichodon* in retaining the typical dentition, $i\frac{3-3}{3-3}$, $c\frac{1-1}{1-1}$, $p\frac{4-4}{4-4}$, $m\frac{3-3}{3-3}=44$, and in the uninterrupted course of the dental series, not any of the teeth having a crown much higher or longer than the rest.

The paper is illustrated by drawings.

III. "Researches into the Chemical Constitution of the Opium Bases. Part I.—On the Action of Hydrochloric Acid on Morphia." By Augustus Matthiessen, F.R.S., Lecturer on Chemistry in St. Bartholomew's Hospital, and C. R. A. Wright, B.Sc. Received May 6, 1869.

It has been shown that when narcotine is heated with an excess of concentrated hydrochloric or hydriodic acid, one, two, or three molecules of methyl are successively eliminated, and a series of new bases homologous with narcotine obtained. It appeared interesting to see if any similar reactions took place with morphia; and for this purpose a quantity of that base, in a perfectly pure state, kindly furnished by Messrs. M'Farlane, of Edinburgh, was submitted to experiment. The purity of the substance was shown by the following analysis.

It was found that although crystallized morphia does not lose its water of crystallization in an ordinary steam drying-closet (*i. e.* slightly below 100°), yet it readily loses the whole when placed in a Liebig's drying-tube immersed in boiling water, dry air being aspirated over it.

* Odontography, 1846, p. 602.