known that ammonia reacts on carbon at a white heat, producing cyanide of ammonium and hydrogen, so that the genesis of the cyanogen spectrum under the present conditions is a crucial test of the validity of our former observations on this subject, which are, however, in marked disagreement with the results obtained by Mr. Lockyer, in his review of the same field of investigation.

Both the indium lines 4101 and 4509 are persistently reversed, together with several lead lines. Tin gives flutings in highly refrangible portions of the spectrum, and silver gives a fine fluted-looking spectrum in the blue. Chloride of calcium gives a striking set of six or seven bands between L and M, which may be seen both bright and reversed.

When the small rod *c* is removed, it is easy at any moment to sweep out the vapours in the tube by blowing through it; it is equally easy to pass in reducing or other gases. Ammonia introduced seems to facilitate the appearance of reversed lines. On passing this gas through a tube containing magnesia, the set of lines just below *b*, which we have always found to be associated with the presence of magnesium and hydrogen, and is most probably due to some compound, instantly appear.

The above is a brief abstract of the few observations we have been able to make as a preliminary to a more thorough research, and we feel warranted in thinking that the method promises to solve some intricate spectroscopic problems. When we can command several electric arcs to heat a considerable length of carbon tube, and are enabled to examine the radiation of a powerful arc passing through vapours in the tube, valuable results may be anticipated.

XI. "On the Ultra-violet Spectra of the Elements. Part I. Iron." By G. D. Liveing, M.A., F.R.S., Professor of Chemistry, and J. Dewar, M.A., F.R.S., Jacksonian Professor, University of Cambridge. Received June 8, 1882.

(Abstract.)

By means of photographs taken with a Rutherford grating of 17,296 lines to the inch, the authors have determined the wave-lengths of ninety-one of the most prominent lines in the spark spectrum of iron between wave-lengths 2948, the termination of Cornu's map of the solar spectrum, and 2327, and also of fourteen of the strongest lines in the spark spectrum of copper beyond that up to the wave-length 2135. Using these lines as lines of reference they have, from photographs taken with calcite prisms, deduced the wave-lengths of 584 more lines in the arc and spark spectra of iron within those

limits. These lines are mapped on the same scale as Ångström's and Cornu's maps of the solar spectrum. The paper describes the method of taking the measures, and gives in detail the quantities observed and the data on which the calculations are founded.

Part II. Received June 15, 1882.

(Abstract.)

In the second part of this paper the authors have given a map of the ultra-violet lines of potassium, sodium, lithium, barium, strontium, calcium, zinc, mercury, gold, thallium, aluminium, lead, tin, antimony, bismuth, and carbon, as developed in the arc. They point out that in several cases the lines are in all probability harmonically related, as shown by the repetition of similar groups of lines at regularly diminishing distances, the groups being alternately sharply defined and diffuse, and becoming more diffuse as they die away at the end of the series. They had previously called attention to this kind of relationship between the visible lines in the spectra of the alkalies and of magnesium. The like relationship holds good in the ultra-violet spectra of those metals, and is strongly marked in the cases of calcium and zinc, less strongly in some other metals.

XII. "General Observations on the Spectra of Carbon and its Compounds." By Professor G. D. Liveing, M.A., F.R.S., and Professor James Dewar, M.A., F.R.S. Received June 12, 1882.

In our two former papers on the spectra of the compounds of carbon with hydrogen and nitrogen ("Proc. Roy. Soc.," vol. 30) we described the results of a long series of synthetical and analytical experiments which had enabled us to trace satisfactorily a fluted band spectrum which occurs in the arc and spark discharge in many compounds of carbon, and generally when carbon poles are used to transmit the current of the arc or spark in air, to the compound substance cyanogen. This led to a further investigation of the carbon ultra-violet line spectrum in order to complete the series of simple vibrations which originate from this substance. After all this work a great deal remains to be ascertained regarding the conditions which cause a variation of intensity in the different series of carbon flutings which originate from cyanogen, and also their persistency and development.

The present paper is a short record of the particular variations in the carbon groups which are revealed in the different photographs of the spectrum of the arc discharge that we have had occasion to take