

ASTRONOMISCHE NACHRICHTEN.

N^o 2904.

Note on the Spectrum of Uranus.

As part of the general spectroscopic survey of the heavenly bodies in which I have lately been engaged in connection with the meteoritic hypothesis, it became necessary to consider the spectra of the outer planets which, as is well known, differ from those of the inner ones.

Laboratory work showed that the apparent dark bands which have been mapped by Vogel and Huggins are in all probability not due to the absorption of any known substances, and it therefore became necessary to seek some other explanation of the spectrum.

A comparison of the spectrum with that of 1st Cygnus and other members of Group I suggested that the spectrum is really a radiation spectrum, the apparent dark bands simply indicating defect of radiation in the regions where they occur. Unfavourable weather has delayed the testing of this suggestion, and even now very few observations have been made, so that the results are not to be regarded as final. They are sufficiently suggestive, however, to be published at once, so that other observers with better observing conditions than those of London may take advantage of the present opposition to investigate the matter.

On April 29th I made careful observations of the spectrum at South Kensington with the 10 inch equatorial and a new direct-vision spectroscope, and the impression I received was that there were undoubted indications of bright flutings. Comparisons and measurements of these were made on April 28, 29, 30th and May 1st by Mr. Fowler, who found that Vogel's map is substantially correct as far as positions are concerned. The bright flutings which were measured were found to be generally coincident with the edges of the fainter dark bands shown in Vogel's map. The brightest flutings were found to be about wave-lengths 519, 483, 451, 440 and 431, and there was also an ill-defined brightness about 558-564. The first of these is a little less refrangible than the brightest fluting seen in the spectrum of the flame of a spirit lamp or Bunsen burner, and the fluting at 431 is coincident with the

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hydro-carbon fluting in the violet, as nearly as could be determined with the dispersion employed. The other flutings 483, 451, 440, are apparently coincident with the flutings of cool carbon, though there has not yet been an opportunity of comparing these directly with the spectrum of the planet. The brightness 558 and 564 was determined by comparison with the brightest fluting in the spectrum of manganese chloride in the flame of the spirit lamp. The strongest apparent absorption band was found to extend from the line at 540 in the spectrum of the manganese chloride, to the first fluting of lead at 546 seen when lead chloride is volatilized in the spirit lamp flame.

The bright flutings were best seen without a cylindrical lens, but they were also visible with it, and even with a Maclean spectroscopic eyepiece.

Mr. Common having placed his magnificent 5 foot reflector at my disposal for this observation, Mr. Fowler visited his observatory on May 16th, and in conjunction with Mr. Taylor, fully confirmed the observations made at Kensington. Each made independent drawings of the light curve of the spectrum, and these agreed perfectly as far as the brightest flutings were concerned. It may be noted that although the slit was nearly fine enough to divide *D*, and the spectrum was very bright, no traces of any of the solar lines were seen.

From the observations as far as they have at present gone, the presence of bright flutings seems certain, and it is equally certain that some of these are due to carbon.

From this new point of view the principal apparent absorption band is the comparatively dark space between the line of manganese at 540 and the edge of the bright lead fluting at 546. The other dark bands are also probably due to contrast.

If subsequent observations with telescopes of large apertures confirm the conclusion that the spectrum of Uranus consists of bright flutings, the prevailing ideas of its constitution must be entirely reconsidered.

J. Norman Lockyer.

On the Spectrum of Uranus.

Neither I in 1871 nor Professor Vogel in 1872 was able to see the Fraunhofer lines in the faint spectrum of Uranus.

On June 3 of this year I obtained a photographic spectrum of the planet from just above *F* to beyond *N*. All the principal solar lines are clearly seen; I am not able to detect other lines either bright or dark.

I may mention that in photographs of the spectrum of Saturn and his rings taken in 1881 and in the present year, I am not able to detect any lines other than those of the solar spectrum.

Upper Tulse Hill, S. W., 1889 June 11.

William Huggins.