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*"To the solid ground  
Of Nature trusts the mind which builds for aye."*—WORDSWORTH

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bright parts having the aspect of short lines, not occupying the whole width of the spectrum. This was perhaps merely a result of fatigue of the eyes; these phenomena were only produced during the first two nights.

It appeared to me important to follow the modifications the spectrum might undergo as the comet went away from the sun. These modifications were produced with perfect distinctness. In the spectrum of the nucleus the violet radiations were extinguished first. About June 30 the most refrangible part, commencing with the green band ( $\lambda = 516$ ), had sensibly lost its brightness and became invisible in the region G, while the yellow and red appeared to me as bright as on the first day. The bands, masked at first by the brightness of the continuous spectrum, became each day more visible in the neighbourhood of the nucleus, and during the night of July 1 they were perfectly distinguished on the nucleus itself.

The measurements successively made of the bands of the comet and of those of the alcohol flame led me to conclude the identity of the two spectra. The green band, however, the most brilliant, seemed a little more refracted in the comet than in the flame. To submit this matter to a decisive test, a total reflection-prism was adjusted on the slit so as to cover half of it. On placing the two spectra together I observed that they were strikingly similar when they had the same brightness, but that the green band appeared indeed more refracted in the comet when the spectrum of the flame was more brilliant. The comparison made directly between the two spectra, and the perfect coincidence of the bands, dispense with the necessity of giving numbers furnished by my micrometric measurements. They would not add anything to the certainty of the result.

As to the violet band, it has not been possible for me to see it in a certain manner, even using a very small dispersion and a very small ocular enlargement. There is not in this fact anything surprising, if we take account of atmospheric absorption and of variations of brightness undergone by the violet band, when the experimental conditions are varied. We know that in the ordinary flame of alcohol it is very brilliant; but if this flame be cooled by means of several folds of metallic sheeting, it becomes very weak and tends to disappear, while the other bands sensibly retain their habitual aspect.

Continuing my observations till the present, I have found the continuous spectrum of the nucleus diminish progressively in brightness and extent, especially on the violet side. At present it has the aspect of a thin luminous thread, hardly passing beyond the line F. The bands, on the other hand, seem to have retained their intensity in the head of the comet. In the tail, and to a distance from the nucleus equal to twice or thrice the diameter of the head, they are still seen, but very faintly. Further on one sees only a continuous spectrum due perhaps to the light of the moon diffused by the haze, pretty thick during the last nights of observation.

It seems to result from this that the cometary mass is formed in part of an incandescent gas, characterised by the spectrum of bands, and in part of solid or liquid matter, likewise incandescent, but in a state of extreme division, emitting a white light which belongs to it, and capable of reflecting in a certain proportion the light it receives from the sun. All the spectroscopic observations hitherto made on comets indicate the existence of carbon in the gases producing the band-spectrum. Dr. Huggins has given this conclusion a striking demonstration by showing, with photography, the existence of two bands of carbon in the ultra-violet spectrum of the comet.

I have the honour to submit to the Academy three drawings representing (1) the spectrum of the alcohol flame, (2) the spectrum of the comet during the night of June 24, and (3) the same spectrum on July 1.

#### WIDTH OF MR. RUTHERFURD'S RULINGS

BY the direction of C. P. Patterson, the Superintendent of the U.S. Coast and Geodetic Survey, I have long been engaged in the precise measurement of a wave-length of light, in order to obtain a check upon the secular molecular changes of metallic bars used as standards of length. In advance of the publication of this work it may be useful to say I have found that the closest-ruled diffraction-plates by Mr. Lewis Rutherford have a mean width of ruling which varies in different specimens from 68078 to 68082 lines to the decimetre, at 70° F. There is a solar spectral line, well suited for precise observation, whose minimum deviation with one of Mr. Rutherford's plates in the spectrum of the second order with the closest ruled plates is  $45^{\circ} 01' 56''$  at 70° F. I would propose that this line be adopted as a standard of reference by such observers of wave-lengths as desire to escape the arduous operation of measuring the mean width of their rulings; for by means of the measures which are shortly to be published it will be possible to deduce from the minimum deviation of this line produced by any given grating, the mean width of that grating, and consequently the wave-length of any other line whose deviation has been observed with it. The accuracy of this method will greatly exceed that of assuming Ångström's measures to be correct. The wave-length of the line in question (still subject to some corrections which may be considerable) is 5624825. Ångström gives 562336.

C. S. PEIRCE

#### CITY AND GUILDS OF LONDON INSTITUTE

IT would seem as if at last, after long years of waiting, there were some hope that the views which for the last quarter of a century have been so persistently advocated touching technical education, were about to bring forth more fruit in London.

In season and out of season, since the note was first sounded by the late Prince Consort, one far-seeing advocate after another, and among these we must specially name Mr. Samuelson, Mr. Mundella, and Sir Henry Cole, have cried in the wilderness touching the need of more scientific instruction. At last it does seem as if there is an awakening, as if a part of the idea was realised in the Institute, the foundation-stone of which was laid at South Kensington on Monday by the Prince of Wales. No doubt in the building which has been begun a national school of science, theoretical and applied, worthy of a country like ours, may grow up. Mr. Mundella will rejoice that at last he has an opportunity of carrying out with something like adequacy the views on education of which he has been so long a strenuous advocate. We hope next week to give a detailed description and illustration of the new building; and meanwhile will content ourselves with briefly referring to what took place on Monday.

The company present to receive the Prince of Wales was large and distinguished, including many eminent men of science. The Lord Chancellor, as Chairman of the Institute, addressed the Prince, expressing the gratification of the Council that His Royal Highness had consented to become president. The Lord Chancellor then traced the growth of the Institute and the efforts of the City Guilds to improve the technical education of the country.

"Since July of last year," the Lord Chancellor said, "the date of the incorporation of the Institute, its work has satisfactorily increased, and the Council have a lively and grateful recollection of the assistance and encouragement afforded to them by His Royal Highness Prince Leopold, Duke of Albany, who in May last laid the foundation-stone of the Finsbury Technical College, a college that has been established by this Institute, and

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