there are three errors; p. 147, line 7, dele "is *r*," there are two other errors on this page; p. 187 we have a vague reference to Boole's Differential Equations, and a misprint lower down; there are other minor errors easily detected, but when correcting pp. 114 to 116, somebody must have had his eyes shut at times or he would not have passed such a number of clerical errors.

In IV. we have a fresh work, well adapted for the higher forms in schools, though the examples are in some cases difficult. There are good notes, and the whole book may be recommended to students reading for scholarship or for college terminal examinations. We could put our finger upon many a mistake easily detected by an advanced student, so that we should advise junior pupils not to spend too long a time upon the questions if they do not succeed in getting the same answer as is given in the text. In making this statement we are bound to say that the number of mistakes seems to be no greater than is almost inevitable in a first edition.

The manual V. contains "more than 160 deductions which have been set at public examinations, worked out in full as examples, together with a collection of specimen examination papers, which have been set at the examinations, Cambridge Mathematical Tripos, London University Matriculation, &c." This fuller title gives a good idea of the scope of the work: it aims at doing for junior students what is done for higher students by McDowell's exercises on Euclid and in Modern Geometry. We have only been able to look into the book casually; we have found the parts so examined correct and put in such a way that a lad acquainted with the text of Euclid ought to have no difficulty in following the proofs here given. The student has to draw his own figures. The printing is good and so done as to assist the reader in his work. From the initials attached to the preface we should infer that the compiler is Mr. A. T. Fisher, whose "Book of Algebra" in the same series we commended, at the time of its publication, in these columns.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Spectrum of Brorsen's Comet

I HAVE to thank Dr. Marshall Watts for having called attention to a point of some interest with regard to the spectra of comets, viz., which of the carbon spectra agrees with the cometary spectrum? In the case of Brorsen's comet the most important question was, whether the spectrum differed *largely* from that of other comets, as found by Dr. Huggins in 1868, and not having much leisure at the time of writing to examine the question of the different spectra of carbon, I overlooked the circumstance that the comparison spectrum used by Prof. Young was the first or flame spectrum of carbon. The difference, however, in the positions of the bands in the two spectra of carbon is a quantity which it is not very easy to answer for in the case of a faint cometary spectrum, and it is but a small fraction (less than one-fourth) of the discordance between Dr. Huggins's measures in 1868 and those made at the present return of the comet.

In the comparisons made at Greenwich the induction-spark (without Leyden jars) was taken in a vacuum-tube containing alcohol vapour at a pressure of 1·2 mm., and the green comet-band was compared with this spectrum exactly in the manner described by Dr. Watts, though practical difficulties of manipulation prevented our making comparisons with the flame spectrum, as I wished. In fact the awkward position of the spectroscope in observing the comet below the pole made the observations extremely difficult, and caused great loss of time, so that the results are not so numerous as they would otherwise have been. On April 17 I used a micrometer eye-piece, with a movable bar, the breadth of which corresponded to 30 tenth-metres, whilst the slit was of such a width that the line with which the band in the alcohol-spectrum commences was 45 tenth-metres broad. The bar was brought up from the blue end so as just not to hide the less refrangible edge of the comet-band; the spectrum from the alcohol vacuum-tube was then flashed in, and the less refrangible edge of the carbon-band was found to be just visible beyond the bar. Several comparisons were made in this way, and I estimated that the uncertainty in the determination of the coincidence between the less refrangible edges of the comet and carbon-bands was but a small fraction of the breadth of the bar (30 tenth-metres). I did not obtain any micrometer readings. On April 19 and 28 Mr. Maunder, from readings with a bright-line micrometer, found for the position of the bright edge of the comet-band in the green, compared with the centre of the line at the edge of the alcohol-band (wave-length, 5198·3):—

	Comet-band. Tenth-metres.	Wave-length inferred.	Width of Slit.
April 19	0·5 to blue	5190	0·009 in. = 16 tenth-metres.
28	4·5 to red	5191	0·013 ,, = 24 ,,

In computing the wave-length of the bright edge of the comet-band, half the breadth of the alcohol-line (= width of slit) has been applied. In a similar manner the wave-length of the bright edge of the comet-band in the yellow was found to be 2·4 tenth-metres to the red of the edge of the alcohol-band at 5610·5, or at 5580, allowing for the width of the slit, which was 0·033 in. or 65 tenth-metres. The position of the blue band was estimated to be *approximately* coincident with the blue band of alcohol at 4834, but this determination is very rough indeed. The dispersion used was that of one "half-prism," viz., 20° from A to H, equivalent to four flint prisms of 60° with a magnifying power of twelve. In my former letter I, by mistake, gave the dispersion as equivalent to two prisms only, instead of four. The high dispersion used is of course an important element in estimating the accuracy of the determination, and on comparing afterwards the flame and vacuum-tube spectra of carbon with the width of slit and other conditions of observation the same as on April 17 and 19, I found the two bands so widely separated that it appeared impossible to mistake one for the other in estimating a coincidence. I may add that the spectrum of Coggia's comet also was found to be identical with the second spectrum of carbon. With regard to Dr. Huggins's observations of Comet II. 1868, and Coggia's comet, Dr. Watts does not give his reasons for the assertion that the comparison spectrum was the first spectrum of carbon. According to the diagram given by Dr. Huggins, the spectrum in olefiant gas is distinctly different from that in olive oil, which I presume is the first spectrum, and the comet-spectrum agrees with the former. As far as I can judge, this is the spectrum which we have obtained in vacuum-tubes, whether they contain alcohol, carbon-oxide, carbon-dioxide, or olefiant gas. I do not wish to enter on the question as to whether the differences in the carbon-spectra result from differences of chemical composition or of molecular condition depending on temperature, though I may remark that the same vacuum-tube gives quite a different spectrum when Leyden jars are introduced into the circuit.

W. H. M. CHRISTIE

Royal Observatory, Greenwich, May 17

End-on Tubes, brought to Bear upon the Carbon and Carbo-Hydrogen Question

IN NATURE, vol. xx. p. 28, there is an important paper by Dr. Marshall Watts, touching certain recent observations of carbon spectra so-called, which seems to offer an excellent opportunity for clearing up certain long-disputed points in spectroscopy, and to the satisfaction, I hope, of every one.

Firstly, the Doctor alludes to the recent happy case of Prof. Young, of Princeton, U.S., having last month compared the green band of Brorsen's comet with the green band of a Bunsen gas burner, and found them identical in spectrum place, thereby