tion, that "the drainage of the Cazembe's country is all into the Nyanza on the east."

The Nile of Egypt, in thus having its source at the opposite side of the continent of Africa, within a short distance of that ocean into which it does *not* flow, only follows an almost general law of Nature. In the *Athenæum* of July 22nd, 1865, when commenting on Sir Samuel Baker's announcement of his discovery of the Albert Nyanza, I compared the Nile and its Lakes with the Po and its Lakes, pointing out how the two rivers have some of their sources in *snowy* mountains, not at the extremity but at the side of their respective basins. Dr. Livingstone's present discoveries seem to establish the fitness of this comparison, and to extend it. For as the Po, whose exit is in the Adriatic, has its head sources in the Cottian and Maritime Alps, within a few miles of the Gulf of Genoa; so, in like manner, the Nile, which flows into the Mediterranean, has its head on the Mossamba Mountains, within 300 miles of the Atlantic Ocean.

The spot which I have thus discovered to contain the hitherto hidden Source of the Nile, and so to reveal

—fluori causas per sæcula tanta latentes,
Ignotumque caput,

is the most remarkable culminating point and water-parting of the African Continent, if not of the whole world; for, within the space of a degree east and west (between 18° and 19° E. long.) and half as much north and south (between 11° 30′ and 12° S. lat.) it includes not only the head of the mighty Nile, which runs northwards over one-eighth of the entire circumference of the globe, but likewise those of the Kuango, (Congo), the Kuanza and the Kunene flowing westwards; those of the Kuivi and the Kubango running to the south; and that of the Lungebungo having its course eastward and forming the head stream of the Zambesi. It is, in fact, what I have been endeavouring to determine since 1846, "the great *hydrophylacium* of the continent of Africa, the central point of division between the waters flowing to the Mediterranean, to the Atlantic, and to the Indian Ocean" (*Journal of the Royal Geographical Society*, vol. xvii. p. 82), as likewise to Lake Nyami, or some other depression in the interior of the continent.

Bekesbourne, Feb. 2 CHARLES BEKE

Analogy of Colour and Music—Supernumerary Rainbows

IN what I saw of a recent discussion in your paper as to the analogy between the colours of light and musical notes, I did not observe any reference made to an analogy on this subject, published, I believe, in 1845, by Prof. Mossotti, of Pisa. The analogy is pointed out at the end of a paper concerning the diffraction spectrum. This spectrum, the disposition of the colours in which depends solely on the wave-lengths, has its point of maximum brightness in the middle, which in this spectrum is occupied by a shade of colour rather nearer to the line E than D.

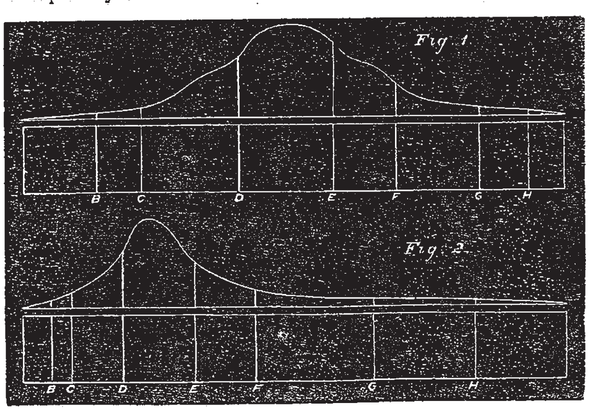

Fig. 1 represents the positions of the lines in the diffraction spectrum; and fig. 2 represents the spectrum formed by refraction through a certain flint glass prism which belonged to Fraunhoffer. The ordinate of the curve which is drawn above each spectrum represents the intensity of the light at each place of that spectrum. The curve drawn above fig. 2 is that due to Fraunhoffer's actual observations with the prism above referred to. The intensity of the light in the neighbourhood of the principal lines is given by him by the following numbers:—

B	C	D	E	F	G	H
·032	·094	·64	·48	·168	·031	·0056

These intensities were determined by comparison with the light of a lamp placed at various distances. It is hard to say, however, what physical and physiological facts are included in these numbers.

The curve given in fig. 1 is constructed by Mossotti analytically, on a principle which amounts to this:—He takes hold of the spectrum in fig. 2, and shifts it so that the fixed lines come into the positions of fig. 1, and decreases or increases the ordinate representing the brightness in the neighbourhood of each fixed line in exactly the proportion that the spectrum has been expanded or contracted in the neighbourhood of that line. The change of place of portions of colour not in the immediate neighbourhood of one of these lines is regulated by a formula founded on a certain physical investigation of Mossotti's as to the dependence of the refraction index upon the wave-length, which formula has its constants determined by the method of least squares, so as to represent with sufficient accuracy the truth at the fixed lines.

Following a method similar to that adopted by Newton, Mossotti supposes the spectrum in fig. 1 to be bent round the complete circumference of a circle, and he finds that if x be the wave-length in millionths of a millimetre at a point distant by an arc whose circular measure is x, from the brightest portion of the spectrum, then x is given for the fixed lines with sufficient accuracy by the formula

$$x = 553{\cdot}5 + 184{\cdot}5 \frac{\phi}{\pi},$$

extending this formula to the ends of the spectrum, it constrains the longest wave-length to be 738, and the shortest 369 millionths of a millimetre. This result Mossotti regards as sufficiently near the actual wave-lengths of the extremities of the spectrum.

The longest and shortest wave-lengths taken in conjunction with the wave-lengths of the brightest part of the diffraction spectrum and of the fixed lines B C D E F G H form ten wave-lengths, which Mossotti thus compares with the notes of the diatonic scale:—

1	$\frac{17}{25}$	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{25}{18}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{13}{8}$	2
$\frac{1}{738}$	$\frac{1}{688{\cdot}3}$	$\frac{1}{656}$	$\frac{1}{590}$	$\frac{1}{553{\cdot}5}$	$\frac{1}{531}$	$\frac{1}{492}$	$\frac{1}{443}$	$\frac{1}{393{\cdot}5}$	$\frac{1}{369}$
738	688	656	589	553·5	526	484	429	393	369
—	B	C	D	—	E	F	G	H	—

The first line represents the number of vibrations necessary to produce the notes of the diatonic scale. The numbers in the second line have the same ratio as the numbers in the first, and therefore the denominators of these fractions represent the wave-lengths of the respective notes. The third line represents the lengths in millionths of a millimetre of the waves corresponding to the lines respectively placed under them.

I need not here give any opinion as to the utility or inutility of such analogies, but I shall be glad if this letter should call the attention of any of your readers to the remarkable symmetry of the diffraction spectrum, which is in fact Nature's own graphical method of exhibiting the numerical wave-lengths which correspond to each part of the spectrum.

Trinity College, Cambridge, Feb. 9 JAMES STUART

IN your journal of January 20th Mr. Grove has honoured my little note on "Colour and Music" by a letter on the subject, in which attention is directed to a rainbow, or series of rainbows, *within* the primary. Mr. Grove asks if a description of this phenomenon has been published, and whether the effect may not be a repetition of the colours of the spectrum after the manner surmised by Sir John Herschel. I will endeavour as briefly as possible to reply to these inquiries.

So far as I can trace, the mention of inner or "supernumerary" bows first occurs in the Phil. Trans. for 1722, p. 241. It is there described by a Dr. Langwith, who had seen the phenomenon no less than four times in the course of that year. On one occasion it was so favourably seen, and lasted so long, that his is able to give the following careful description. Under the usual primary bow, Dr. Langwith says, "was an arch of green, the upper part of which inclined to bright yellow, the lower to a more dusky green; under this were alternately two arches of reddish purple and two of green, under all a faint appearance of another arch of purple, which vanished and returned several times so quick that we could not readily fix our eyes on it."