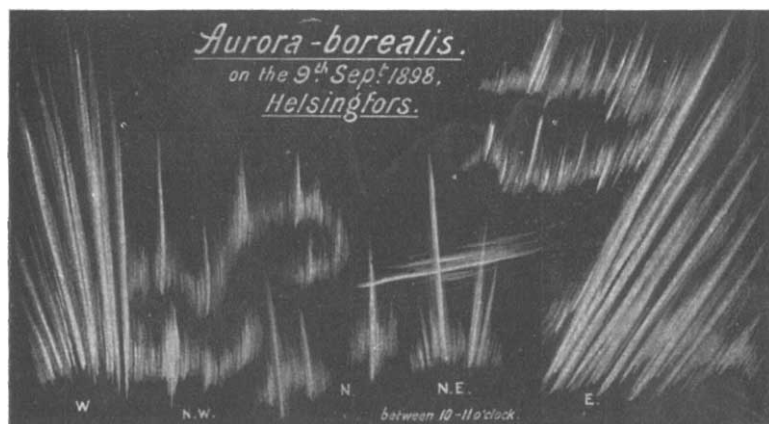


LETTERS TO THE EDITOR

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The Aurora Borealis of September 9.

I HAVE read, with much interest, in NATURE of September 15, the article concerning the aurora borealis of September 9, and it may be of interest to your readers to know that this



beautiful phenomenon displayed its splendours the same evening in all parts of Finland territory.

On that day I had the good fortune to see it in Helsingfors, from its earliest beginning to its end, in a clear, perfectly cloudless sky, and a calm and transparent air. These favourable conditions enabled me to sketch the principal movements of it, and I send you herewith a copy of the drawing I made.

The aurora was not only one of the most splendid that has been seen, but also that has appeared in our latitude for a long series of years. It began a little before 9 o'clock, and at 10 arrived at its maximum brilliancy, a state in which it, ever changing, remained till 11 o'clock, displaying the whole time an exceedingly beautiful brightness in all its parts.

The display began with a very bright arc in the north, but this very soon disappeared, while at the same moment exceedingly brilliant streamers extended at once up from the western and eastern horizons, sending immense columns to the zenith, and taking the shape of a colossal arc arching the whole sky from horizon to horizon. Masses of light flowed from both sides to the zenith, where they seemed to disappear. At 10 o'clock the great arc was interrupted on both sides by a dark region, the bright streamers remaining only on opposite horizons; but in the same moment a corona of the highest splendour appeared in the zenith, consisting of three nearly parallel streamers, stretching from west to east, and ending towards the west in the dark space, and towards the east in a beautiful fan of light. Half an hour later the corona took the shape of an immense dome, the ribs and columns of which stood around all parts of the horizon. The whole visible sky at that moment presented one single enormous dome of indescribable beauty. The brightest columns of this dome were to the west and to the east, those to the north were much less bright, and the columns to the south were scarcely visible. From every part of this dome streamers of light, without interruption, flowed up to the zenith.

At 11 o'clock, when the dome suddenly disappeared, the corona took the shape of a luminous spiral-ring, sending short

but very bright streamers in all directions, especially to the east. This latter formation was surrounded by quite black spaces of sky, which made the luminous phenomena look more beautiful.

Meanwhile, in the northern part of the sky, the aurora took the shape of ever-changing columns, and long, sometimes spiral and undulating bands, which twice, in the north-west and in the north-east, doubled, resembling curtains hanging one over the other.

A little after eleven I saw in the north a very strange formation of aurora; three vertical columns in their upper part were crossed by a bright horizontal streamer, extending nearly from north-west to north-east.

Soon after 11.30 the aurora began to vanish everywhere, and, in a very marked manner, took more and more the aspect of some luminous shapeless cloud. After 12 o'clock all traces of columns and streamers disappeared, and at 1 o'clock nothing more of the phenomenon was to be seen.

N. KAULBARS.

Helsingfors, September 28.

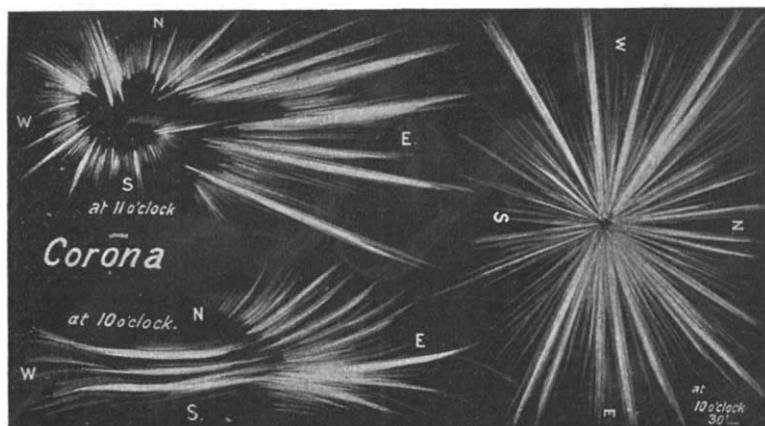
Fourier's Series.

IN a letter to NATURE of October 6, Prof. Michelson, referring to the statement that a Fourier's series can represent a discontinuous function, describes "the idea that a real discontinuity can replace a sum of continuous curves" as "utterly at variance with the physicists' notions of quantity." If, as this seems to imply, there are physicists who hold "notions of quantity" opposed to the mathematical result that the sum of an infinite series of continuous functions may itself be discontinuous, they would be likely to profit by reading some standard treatise dealing with the theory of infinite series, such, for example, as Hobson's "Trigonometry," and the paper by Sir G. Stokes quoted on p. 251 of that work.

Prof. Michelson takes a particular case. He appears to find a difficulty in the result that the sum of the series

$$y = 2[\sin x - \frac{1}{2} \sin 2x + \frac{1}{3} \sin 3x - \dots]$$

is equal to x when x lies between $-\pi$ and π , is equal to $-\pi + x$ when x lies between π and 3π , and so on, and further is equal to zero when x is $-\pi$, or π , or 3π , and so on.



With the view of stating his difficulty simply, he has tried to sum this series, and the series obtained from it by differentiating its terms, for values of x of the form $\pi + \epsilon$, where it appears to be meant that ϵ is positive and less than 2π .

The series (thus obtained) for y and dy/dx are given by the equations

$$-\frac{1}{2}y = \sin \epsilon + \frac{1}{2} \sin 2\epsilon + \frac{1}{3} \sin 3\epsilon + \dots + \frac{1}{n} \sin n\epsilon + \dots$$

$$-\frac{1}{2} \frac{dy}{dx} = \cos \epsilon + \cos 2\epsilon + \cos 3\epsilon + \dots + \cos n\epsilon + \dots$$