The author then adverts to the suspicion of inaccuracy in some parts of these results, arising from the circumstance that Kirchhoff's apparatus was not always in precisely the same state of adjustment. After expressing his own *à priori* belief that the error, if any, must be extremely small, he adverts to the comparison which he was now enabled to make between direct measures of wave-length by Ångström and Ditscheiner, and his own computations. Admitting the systematic errors of Fraunhofer which the later philosophers have indicated, and the errors incidental to interpolation and extrapolation, the remaining discrepance is very small. Its progress is so easy that there is no difficulty in interpolating its value for any one line; and thus, using the computed wave-lengths of this memoir, the wave-length for any line may be found as it would have been measured by Ångström or Ditscheiner.

In the tabular part of the communication, the principal Table contains Kirchhoff's measures and symbols, extracted from the Berlin Memoirs 1861 and 1862, with the addition throughout of one column containing the author's computed wave-lengths expressed in parts of the millimetre. This is followed by a special Table, in the same form, for the lines produced by certain metals not included in the general Table. There is then given a Table of the wave-lengths corresponding to the lines produced by different metals, extracted by the author from the general Table. And finally there are given two Tables containing respectively the comparisons of Ångström's and Ditscheiner's direct measures of wave-lengths with the wave-lengths computed by the author.

II. "On a remarkable Alteration of Appearance and Structure of the Human Hair." By Erasmus Wilson, F.R.S. Received March 12, 1867.

I have the honour of submitting to the Royal Society a specimen of human hair of very remarkable appearance. Every hair is brown and white in alternate bands, looking as if encircled with rings; and this change of aspect extends throughout the whole length of the hair, and gives to the general mass a curiously speckled character. The brown segment of the hair, which represents its normal colour, measures about $\frac{1}{50}$ of an inch in length, or something less than a quarter of a line; the white, or abnormal segment about half that length, namely $\frac{1}{100}$ of an inch; and the two together about $\frac{1}{36}$ of an inch, or one-third of a line.

The hair was taken from a lad aged seven years and a half, a gentleman's son; he is reported as being "an active, healthy boy, quick and intelligent." He was delicate up to the age of four, having suffered in quick succession the diseases of childhood, a severe attack of croup, and several attacks of convulsions. The change in the appearance of the hair was first noticed when he was between two and three years old, and has

increased perceptibly during the last two years. There is no similar alteration of structure of the eyebrows and eyelashes. His complexion is dark, while that of a younger brother is fair; and the latter is free from any alteration of the hair.

Examination of the hair with a lens shows that the cylinder of the hair is perfectly uniform, that the white portion is contained within the cuticle and occupies the whole breadth of the cylinder; whilst it frequently presents a rounded cone at the central extremity, and breaks up into fibres at the opposite or distal end; and in some instances this fibrous structure is apparent at both ends of the white segment. Moreover, by transmitted light, the white segment is found to be opake, and consequently presents a dark shade, while the intermediate or brown portion has the transparency of normal hair.

When the transparency of the hair is increased by immersion in Canada balsam slightly diluted with spirits of turpentine, the white and opake segment is reduced in dimensions, and is rendered more or less transparent by imbibition of the volatile fluid; moreover it is clearly demonstrated by this process that the opacity of the segment its whiteness when seen by reflected light, and its darkness by transmitted light, are all due to the presence, in the fibrous portion of the hair, of spaces filled with air-globules. The air-spaces are necessarily very numerous and assembled closely together; while at the ends of the white segment they have more or less of a linear arrangement, and give a fibrous appearance to the opake mass. Moreover the partial transparency of the hair caused by the balsam demonstrates that, besides the air-spaces, large and small, contained in the opake portion, minute air-spaces, sometimes arranged in linear order, and sometimes communicating and forming short irregular canals, are also met with in the transparent part of the hair. And, in addition to the minute air-spaces of the plates of the fibrous portion of the hair, an accumulation of air-globules is also very apparent in the cells of the medulla.

It is evident from this examination of the hairs, that they are imperfect in structure and development, and that their imperfection indicates a weak producing organ, and probably a weakly constitution of the individual; that the cells of which the fibrous portion of the hair is composed, instead of being filled with a horny plasma, are tinged with aqueous fluid, and the desiccation of this fluid leaves behind it vacuities which in the subsequent growth of the shaft become filled with air. The most remarkable phenomenon in connexion with the case, however, is the alternation of imperfect and perfect cells, the period of continuance of the two processes (supposing them to be equally active in point of time) being twice as long for the perfect as for the imperfect structure.

Since the publication of the observations of Berthold in Müller's 'Archiv' for 1850, it is generally believed that the hair grows faster during the day than during the night; hence the first suggestion that occurred to me in connexion with the present case, seeing that the white or opake segment

was shorter by one-half than the brown, was that the former represented the slower growth by night, and the latter the quicker growth by day—the white and the brown together representing an entire day of twenty-four hours. But other observations by myself have given, as the average growth of the hair of the head in persons who had been shaved, $\frac{1}{8}$ of an inch for the week, and consequently $\frac{1}{56}$ of an inch for the twenty-four hours. Now the length of hair comprehended by the white and the brown in the present case is $\frac{1}{36}$ of an inch, and consequently a much more active growth than is normally met with—corresponding, in fact, in a similar ratio, with thirty-seven hours instead of twenty-four.

I therefore refrain from speculating upon the cause of alternation of the healthy and morbid structure presented by this case, and restrict myself to the narration of the fact that during a certain space of time, amounting to a day or more, the hair is produced of normal structure, while during another space of time of undetermined extent the hair is produced unhealthily,—that the periods of healthy formation correspond pretty accurately in extent, as do those of unhealthy formation, while the latter, in measurement, are only half as extensive as the former,—moreover, that the differences of the pathological operation are, the production of a horny plasma in the normal process, and of serous and watery cell-contents in the abnormal process.

I may further observe that it is by no means improbable that the "dead" and faded hair which is met with after some illnesses and in instances of debilitated health may be due to a similar pathological process, although wanting in the periodicity and alternation which render the present case so remarkable.

III. "Remarks on the Nature of Electric Energy, and on the Means by which it is transmitted." By Charles Brooke, M.A., F.R.S., P.M.S., &c. Received March 19, 1867.

The writer has clearly shown the interchange of thermic and dynamic energy at the point of junction of the bars of a thermo-electric element of antimony and bismuth*, and he has also pointed out† that the dynamic nature of electric energy is not less clearly indicated by the long-known fact that an ordinary voltaic current always commences with a rush, as it were, the instant that the circuit is closed. The dynamic cause of this is clearly pointed out by an experiment due to the genius of Prof. Wheatstone. If a tuning-fork, the tail of which is inserted longitudinally into a wooden handle, like a file or chisel, be made to vibrate, and the end of the handle rested obliquely on a table, the resonance of the table will instantly be heard; but on moving the diapason parallel to itself in any

* Phil. Mag. Nov. 1866. † Ibid. Dec. 1866.