"Disregarding now the systematic character of some of the errors, and treating them as purely casual, we get as the average difference between the constants as got by the machine and by calculation from the twenty-four hourly means 0°·065. It may be noticed, however, that the numbers are unusually large (and at the same time very decidedly systematic) in the case of the second cylinder of the first order b_1, for which the average is as much as 0°·150, the seventh of a degree.

"If b_1 be omitted, the average for the remaining cylinders of the machine is reduced to 0°·047.

"We see, therefore, that, with the exception perhaps of b_1, the constants got by the machine for the mean of the days constituting the month are as accurate as those got by calculation, which requires considerably more time, inasmuch as the hourly lines have to be drawn on the photograms, then measured, then meaned, and the constants deduced from the means by a numerical process by no means very short."

The curves for the twelve years 1871 to 1882 inclusive have now been passed through the machine, and the results obtained have been carefully checked so far as the arithmetical work involved is concerned, upon a plan approved by the Council. No *direct* check, short of passing the curves a second time through the machine, can however at present be put on any portion of the results except as regards the means, which have been compared with the means calculated from the hourly readings obtained by measurement from the curves. The results of this work will be published in the Hourly Readings for 1883, but the general results may here be stated.

As a rule, the monthly means yielded by the harmonic analyser agree well within a tenth of a degree with those obtained by calculation from the hourly measurements of the curves; and although in some exceptional cases larger differences have been found, amounting in rare instances to as much as half a degree, it is probable that generally these are less due to defects in the working of the instrument than to other causes. In some cases large breaks in the curves, due to failure of photography, &c., were interpolated when the curves were passed through the machine, but not when the means were worked out from measurements of the curves. Some differences rather larger than usual, and confined chiefly to the earliest years dealt with, have been ascertained to have arisen from the circumstance that when the curves were first measured, to obtain hourly values, the method of making the measurements was not the same as that found by subsequent experience to be the preferable; and also that in some cases the scale-values first used were less accurately determined than has since been found possible.

In both these respects the two methods were on a par in the later years dealt with, and therefore the fairest comparison is to be had with their means.

For 1880, the average difference of the monthly mean for all the seven observatories is 0°·09; for 1881 it is 0°·05; and for 1882 0°·06; and in these three years a difference of 0°·3 between the analyser and calculated means occurred but once, and of 0°·2 but five times.

What has been said is sufficient to show that the instrument is completely applicable to the analysis of thermograms.

It has also been employed on the discussion of barograms, and the curves for the years 1871, 1872, and 1876 have been passed through the machine.

The year 1876 was selected owing to the existing facilities for comparing the resulting figures with those obtained by calculation from Mr. Eaton's means, and the result in this case was equally satisfactory with that for temperature already mentioned.

May 27.—"Family Likeness in Eye-Colour." By Francis Galton, F.R.S.

This inquiry proved that certain laws previously shown by the author to govern the hereditary transmission of stature also governed that of eye-colour: namely, that the average ancestral contributions towards the heritage of any peculiarity in a child are from each parent $\frac{1}{4}$, from each grandparent $\frac{1}{16}$, and so on; also that each parent and each child of any person will on the average possess $\frac{1}{2}$ of that person's peculiarity. The eye-colours were grouped into light, hazel (or dark gray), and dark; then it was shown that $\frac{2}{3}$ of the hazel were fundamentally light, and $\frac{1}{3}$ of them were dark, and they were statistically allotted between light and dark in that proportion. The desired test of the truth of the laws in question was thus reduced to a comparison between the calculated and observed proportion of light- and dark-eyed children born of ancestry whose eye-colours presented various combinations of light, hazel, and dark. The inquiry was confined to children of whom the eye-colours of both parents and of all four grandparents were known. There are six possible combinations of the three eye-colours in the parents, and fifteen in the grandparents, making a total of ninety possible classes, but of these one-half were wholly unrepresented in the returns, and many others were too scantily represented to be of use. The remainder were discussed in six different ways: that is to say, in two groups, *a* and *b*, and each group by three methods. In *a* the families were classified and grouped according to their several ancestral combinations of eye-colour, but only those groups that consisted of twenty or more children were used; there were 16 of these groups and 827 children. In *b* the families were treated separately, but only large families were taken, viz. those that consisted of at least six children: they were 78 in number. In both *a* and *b* separate calculations were made on the suppositions (1) that the parental eye-colours were alone known; (2) that the grandparental were alone known; (3) that the parental and the grandparental were alone known. The conformity between the calculated and the observed numbers throughout every one of the six sets of calculations was remarkably close, and the calculated results obtained by the method (3) were the best.

"Notes on Alteration induced by Heat in Certain Vitreous Rocks, based on the Experiments of Douglas Herman, F.I.C., F.C.S., and G. F. Rodwell, late Science Master in Marlborough College." By Frank Rutley, F.G.S., Lecturer on Mineralogy in the Royal School of Mines. Communicated by Prof. T. G. Bonney, B.Sc., F.R.S.

In this paper an endeavour has been made to ascertain the nature of the changes which are induced in a few typical vitreous rocks by the action of heat only. The specimens experimented upon were—

(1) The pitchstone of Corriegills, Arran.
(2) Black obsidian from Ascension.
(3) Black obsidian from the Yellowstone District, U.S.A.
(4) Glassy basalt lava of Kilauea, Hawaii.
(5) Basalt of the Giant's Causeway, Antrim.

The Arran pitchstone was heated for 216 hours at a temperature ranging from 500° to about 1100° C. The clear, greenish belonites of hornblende, so plentiful in the unaltered rock, were found to have turned to a deep rusty brown through peroxidation of the protoxide of iron which was present in the hornblende. The dusty matter mixed with clear spiculæ of hornblende, which occurred between the belonites and shaded gradually off into the clear glass which immediately surrounded the belonites in the normal state of the rock, has segregated to some extent, a sharp line of demarcation now existing between the dusty matter and the areas of clear glass, while the spiculæ of hornblende have somewhat increased in size if not in number. No actual devitrification of the glass has resulted from the heating.

The obsidian from Ascension showed only a banded structure coupled with streams of colourless microliths and a few felspar crystals when a section of the unaltered rock was examined microscopically. Two specimens of this rock were artificially heated, the first for the same period and at the same temperature as the Arran pitchstone, while the second was kept for 701 hours at a temperature ranging from 850° to 1100° C.

In the first specimen the banded structure disappeared entirely, or almost entirely, but numerous microliths are present in the altered rock, in which the most remarkable change consists in the development of an excessively vesicular structure.

In the second specimen a vesicular structure is also developed, an outer crust consisting of a very thin layer of clear brownish glass, followed by a nearly opaque layer composed of greenish-brown microliths, which shades off into a colourless glass containing similar microliths, which are probably some form of amphibole or pyroxene. The remainder of the specimen has been completely devitrified.

The Yellowstone obsidian in its normal state shows little else but trichites and globulites when examined under a high power.

Two specimens of this rock were heated: the first at from 500° to 1100° C. for a period of 216 hours, the second from 850° to 1100° C. for 701 hours. In the first case a remarkably vesicular structure has been developed; the trichites have entirely disappeared, and small granules and crystals of magnetite have been formed. In the second specimen the changes are very peculiar. The fragment retained its original form, but the surface showed minute blisters or elevations, which, when when cracked open, revealed a cavernous structure produced by