## Note on Coloured Illumination.

By Julius Rheinberg.

(*Read December 18th, 1896.*)

I have the honour and pleasure of bringing before you this evening a new form of substage differential colour illuminator which I have designed in order to simplify and facilitate the use of colour discs and other stops in the substage of the microscope.

You will see that it consists essentially of a box, or slide carrier fitted under the condenser, in which there are a number of metal slides which can be pulled out or pushed in quite independently of one another by means of little handles on both sides of the carrier. Each slide has two circular apertures, the one being fitted with a colour disc or other stop, the other one being left free. The kind of stop is indicated on the handle. The openings in the slides are so arranged that when the apparatus is closed all the free openings coincide, so that illumination can be effected in the ordinary way. When any other illumination is required it is only necessary to pull out the particular stop, or combination of stops, each stop being in accurate position when pulled out as far as it will go.

In the apparatus I have here there are 19 stops, viz., a dark ground stop, four stops which cause the background to assume various colours, four which cause the object to assume various colours, stops causing the object to be illuminated in different colours from opposite sides in various colours (for showing striations), and one causing the object to be illuminated in different colours at right angles to each other, for showing striations etc., similarly situated. There are also stops for oblique light, several annuli, and a ground glass stop, making a compendium no doubt somewhat too great for the general worker, but which is very serviceable to the experimentalist.

As far as colour discs are concerned the stops are so arranged that all those which can be pulled out from the left side of the

carrier cause the background to be coloured, whilst those which can be pulled out from the right side cause the object to be coloured.

The number of effects which can be obtained with such an apparatus is unlimited. Mr. Rousselet showed us some weeks ago an ingenious colour illuminator, by which, according to a little mathematical calculation, 36 effects could be obtained. By applying a similar calculation to this arrangement it would give $19^{13}$ power, or some few hundred millions of combinations. This number may be too much even for an enthusiast, and I prefer to pass over from the quantitative to the qualitative use of the arrangement.

I venture to think, Mr. President, that for simplicity in use it cannot be excelled, as it allows of every kind of illumination and stop being automatically brought into action whilst the object is under examination. The best result can, therefore, be obtained with far greater rapidity than ordinarily, and comparisons can be effected without having to bother about taking stops in and out, as in the ordinary way. The apparatus in my hand, although efficient, is of course needlessly clumsy and heavy. Apart from the brass box, I made it myself, to fit my own instrument. I believe, however, the principle can be easily adopted in a neater form, and made to fit any condenser.