Newton in his experiments diffused a white ray, which was incident on its poſterior ſurface in an angle of 30⁰, in ſuch a manner that the extreme red ray emerged into air, ma­king an angle of 50⁰ 21 2/5' with the perpendicular ; the ex­treme violet ray emerged in an angle of 51⁰ 15 3/5' ; and the ray which was in the confines of green and blue, emerged in an angle of 50⁰ 48 1/3' If the sine of the angle 30⁰ of in­cidence be called 0,5, which it really is, the sine of the emergence of the red ray will be 0,77 ; that of the violet ray will be 0,78 ; and that of the intermediate ray will be 0,77 1/3, an exact mean between the two extremes. This ray may therefore be called the mean refrangible ray, and the ratio of 774 to 50, or of 1,55 to 1, will very properly expreſs the mean refraction of this glaſs ; and we have for this glaſs m *= 1,55.* The sine of refraction, being mea­sured on a ſcale, of which the sine of incidence occupies 100 parts, will be 154 for the red ray, 155 for the mean ray, and 156 for the violet ray. This number, or its ratio to unity, is commonly taken to repreſent the refractive power of the glaſs. There is ſome impropriety in this, un­less we consider ratios as measured by their logarithms : for if *m* be 1, the ſubſtance does not refract at all. The re­fractive power can be properly meaſured only by the refrac­tion which it produces ; that is, by the change which it makes in the direction of the light, or the angle contained between the incident and refracted rays. If two ſubſtances produce ſuch deviations always in one proportion, we ſhould then ſay that their refractive powers are in that proportion. This is not true in any ſubſtances ; but the sines of the an­gles, contained between the refracted ray and the perpendi­cular, are always in one proportion when the angle of inci­dence in both ſubſtances is the ſame. This being a cogniſable function of the real refraction, has therefore been aſſumed as the only convenient meaſure of the refractive powers. Although it is not ſtrictly just, it anſwers extreme­ly well in the moſt uſual cases in optical inſtruments : the refractions are moderate ; and the sines are very nearly as the angles contained between the rays and the perpendicu­lar ; and the real angles of refraction, or deflections of the rays, are almoſt exactly proportional to *m —* I. The moſt natural and obvious meaſure of the refractive powers would therefore be m—1. But this would embarraſs ſome very frequent calculations ; and we therefore find it beſt, on the whole, to take *m* itſelf for the meaſure of the refractive power.

The ſeparation of the red, violet, and intervening rays, has been called *dispersion ;* and although this ariſes merely from a difference of the refractive power in reſpect of the different rays, it is convenient to diſtinguiſh this particular modification of the retractive power by a name, and we call it the Dispersive Power of the refracting ſubſtance.

It is ſuſceptible of degrees ; for a piece of flint-glass will refract the light, ſo that when the sine of refraction of the red ray is 77, the sine of the refraction of the violet ray is nearly 78 1/2 ; or if the sine of refraction of the red ray, measured on a particular ſcale, is 1,54, the sine of refraction of the violet ray is 1,57. The diſperſion of this ſubſtance, being meaſured by the difference of the extreme fines of re­fraction, is greater than the diſperſion of the other glaſs, in the proportion of 3 to 2.

But this alone is not a ſufficient meaſure of the abſolute diſperſive power of a ſubſtance. Although the ratio of 1,54 to 1,56 remains constant, whatever the real magnitude of the refractions of common glaſs may be, and though we therefore ſay that its diſperſive power is constant, we know, that by increaſing the incidence and the refraction, the abſolute diſperſion is alſo increaſed. Another ſubſtance ſhows the same properties, and in a particular caſe may produce the ſame diſperſion ; yet it has not for this ſole reaſon the ſame diſperſive power. If indeed the incidence and the refraction of the mean ray be alſo the ſame, the diſperſive power cannot be ſaid to differ ; but if the incidence and the refraction of the mean ray be leſs, the dipersive power muſt be conſidered as greater, though the actual diſperſion be the ſame ; becauſe if we increaſe the incidence till it be­comes equal to that in the common glaſs, the diſperſion will now be increaſed. The proper way of conceiving the diſ­perſion therefore is, to conſider it as **a** portion of the whole refraction ; and if we find a ſubſtance making the ſame diſ­perſion with half the general refraction, we muſt ſay that the diſperſive quality is double ; becauſe by making the re­fraction equal, the diſpersion will really be double.

If therefore we take *m* as a ſymbol of the ſeparation of the extreme rays from the middle ray, m/(m *— 1),* the natural meaſure ©f the diſperſive power. We ſhall expreſs this in *dm* the Leibnitzian notation, thus dm/(m *—* I), that we may avoid the indiſtinctneſs which the Newtonian notation would oc­caſion when m is changed for *m'* or *m''.*

It is not unuſual for optical writers to take the whole ſeparation of the red and violet rays for the meaſure of the diſperſive power, and to compare this with the refracting power with reſpect to one of the extreme rays. But it is ſurely better to conſider the mean retraction as the meaſure of the refracting power : and the deviation of either of the extremes from this mean is a proper enough meaſure of the diſperſion, being always half of it. It is attended with this convenience, that being introduced into our computations as a quantity infinitely ſmall, and treated as ſuch for the eaſe of computation, while it is really a quantity of ſenſible magnitude ; the errors ariſing from this ſuppoſition are diminiſhed greatly, by taking one half of the deviation and comparing it with the mean refraction. This method has, however, this inconvenience, that it does not exhibit at once the refractive power in all ſubſtances reſpecting any parti­cular colour of light ; for it is not the ray of any parti­cular colour that suffers the mean refraction. In common glaſs it is the ray which is in the confines of the yellow and blue ; in flint glaſs it is nearly the middle blue ray ; and in other ſubſtances it is a different ray. Theſe circumstances appear plainly in the different proportions of the co­lours of the priſmatic ſpectrum exhibited by different subſtances. This will be conſidered afterwards, being a great bar to the perfection of achromatic inſtruments.

The way in which an achromatic lens is conſtructed is, to make uſe of a contrary refraction of a ſecond lens to deſtroy the diſperſion or ſpherical aberration of the first.

The firſt purpoſe will be anſwered if dm/n be equal to **to** — dm'/n'*.*For, in order that the different coloured rays may be collected into one point by two lenſes, it is only necessary that I/fi, the reciprocal of the focal diſtance of rays refracted by both, may be the ſame for the extreme and mean rays, that is, that m

+ — be of the ſame value with - - + ——-, + -e

**r η n r**

which muſt happen if —z + be — o, or — — —- *dm' η η n*

This may bc ſeen in another way, more comprehenſible by ſuch as are not verſant in theſe diſcuſſions. In or-