fancy ; for the eye-glaſs is directed to be made convex ex­ternally, and a very deep concave on the inſide ; ſo that it is, in fact, a meniſcus with the concavity prevalent. In the 86th propoſition, he indeed ſhows that it is poſſible ſo to place a convex glass behind another convex glaſs, that an eye ſhall ſee objects diſtinct, magnified, and inverted ; and he ſpeaks very ſagaciouſly on the ſubject. After having ſaid that an eye placed behind the point of union of the firſt glaſs will ſee an object inverted, he ſhows that a ſmall part only will be ſeen ; and then he ſhows that a convex glaſs, duly proportioned and properly placed, will ſhow more of it. But in ſhowing this, he ſpeaks in a way which ſhows evidently that he had formed no diſtinct notions of the manner in which this effect would be produced, only saying vaguely that the convergency of the ſecond glaſs would counteract the divergency beyond the focus of the firſt. Had he conceived the matter with any tolerable diſtinctneſs, after seeing the great advantage of taking in a field greater in almoſt any proportion, he would have eager­ly catched at the thought, and enlarged on the immenſe im­provement. Had he but drawn one figure of the progreſs of the rays through two convex glaſſes, ſuch as ſig. 12. of Pl. CCCLXIV. the whole would have been open to his view.

This ſtep, ſo eaſy and ſo important, was reſerved for Fa­ther Scheiner, as has been already obſerved in the article Optics ; and the conſtruction oſ this author, together with that oſ Janſen, are the models on which all refracting teleſcopes are now conſtructed ; and in all that relates to their magnifying power, brightneſs, and field of viſion, they may be conſtructed on Kepler’s principle, that the angles of refraction are in a certain given proportion to the angles of incidence.

But after Huyghens had applied his elegant geometry to the diſcovery of Snellius, viz. the proportionality, not of the angles, but of the fines, and had aſcertained the aberrations from the foci of infinitely ſlender pencils, the reaſons were clearly pointed out why there were ſuch narrow limits af­fixed by nature to the performance of optical inſtruments, in conſequence of the indiſtinctneſs of viſion which reſulted from conſtructions where the magnifying power, the quan­tity of light, or the field of viſion, were extended beyond certain moderate bounds. The theory of aberrations, which that moſt excellent geometer eſtabliſhed, has enabled us to diminiſh this indiſtinctneſs ariſing from any of theſe cauſes; and this diminution is the ſole aim of all the different constructions which have been contrived ſince the days of Ga­lileo and Schemer.

The deſcription which has been already given of the va­rious conſtructions of teleſcopes in the article Optics, is sufficient for inſtructing the reader in the general principles of their conſtruction, and with moderate attention will ſhow the manner in which the rays of light proceed, in order to enſure the different circumſtances of amplification, brightneſs, and extent of field, and even diſtinctneſs of viſion, in as far as this depends on the proper intervals between the glaſſes. But it is inſufficient for giving us a knowledge of the improve­ments which are aimed at in the different departures from the original conſtructions of Galileo and Scheiner, the ad­vantage of the double eye-glaſs of Huyghens, and the quin­tuple eye-glaſs of Dollond : ſtill more is it inſufficient for ſhowing us why the higheſt degrees of amplification and moſt extensive field cannot be obtained by the mere proportion of the focal diſtances of the glaſſes, as Kepler had taught. In ſhort, without the Huyghenian doctrine of aberrations, neither can the curious reader learn the limits of their per­formance, nor the artiſt learn why one teleſcope is better than another, or in what manner to proceed to make a teleſcope differing in any particular from thoſe which he servilely copies.

Although all the improvements in the conſtruction of te­leſcopes ſince the publication of Huyghens’s Dioptrics have been the productions of this iſland, and although Dr Smith of Cambridge has giver, the moſt elegant and perſpicuous account of this ſcience that has yet appeared, we do not re­collect a performance in the Engliſh language (except the Optics of Emerſon) which will carry the reader beyond the mere ſchoolboy elements of the ſcience, or enable a perſon of mathematical ſkill to underhand or improve the conſtruction of optical inſtruments. The laſt work on this ſubject of any extent (Dr Prieſtſey’s Hiſtory of Viſion) is merely a parlour book for the amuſement of half-taught dilettanti, but is totally deficient in the mathematical part, although it is here that the ſcience of optics has her chief claim to pre­eminence, and to the name of a disciplina accurata. But this would have been *ultra crepidam ;* and the author would in all probability have made as poor a figure here as he has done in his attempts to degrade his ſpecies in his Commentaries on the V*ibratiunculae* of Hartley; motions which neither the author nor his amplificator were able to underſtand or explain. We truſt that our readers, jealous as we are of every thing that sinks us in the ſcale of nature’s works, will pardon this tranſient ejaculation of ſpleen, when our thoughts are called to a ſyſtem which, of *abſolute and una­voidable neceſsity,* makes the divine mind nothing but a qui­vering of *that matter* of which it is the author and uner­ring director. *Sed missum faciamus.*

We think therefore that we ſhall do the public ſome ſer­vice, by giving ſuch an account of this *higher branch* of op­tical ſcience as will at leaſt tend to the complete under- ſtanding of this noble infiniment, by which our conceptions of the extent of almighty power, and wiſdom, and benefi­cence, are ſo wonderfully enlarged. In the proſecution of this we hope that many general rules will emerge, by which artiſts who are not mathematicians may be enabled to construct optical inſtruments with intelligence, and avoid the many blunders and defects which reſult from mere ſervile imitation.

The general aim in the conſtruction of a teleſcope is, to form, by means of mirrors or lenſes, an image of the diſtant object, as large, as bright, and as extenſive as is poſſible, consiſtently with diſtinctneſs ; and then to view the image with a magnifying glaſs in any convenient manner. This gives us an arrangement of our ſubject. We ſhall firſt ſhow the principles of conſtruction of the object-glaſs or mirror, ſo as that it ſhall form an image of the diſtant object with theſe qualities ; and then ſhow how to conſtruct the magni­fying glaſs or eye-piece, ſo as to preſerve them unimpaired.

This indiſtinctneſs which we wiſh to avoid ariſes from two cauſes ; the ſpherical figures of the refracting and re­flecting ſurfaces, and the different refrangibility of the dif­ferently coloured rays of light. The firſt may be called the spherical and the ſecond the chromatic indiſtinctneſs; and the deviations from the foci, determined by the elemen­tary theorem (Optics, p. 289.), may be called the sphe­rical and the chromatic aberrations.

The limits of a Work like this will not permit us to give any more of the doctrine of aberrations than is abſolutely neceſſary for the conſtruction of achromatic teleſcopes ; and we muſt refer the reader for a general view of the whole to Euler’s *Dioptrics,* and other works of that kind. Dr Smith has given as much as was neceſſary for the companion of the merits of different glaſſes of ſimilar conſtruction, and this in a very plain and elegant manner.

We ſhall begin with the aberration of colour, becauſe it is the moſt simple.