V. *A Way for* Myopes *to uſe* Teleſcopes *without Eye-Glaſſes, an Object-Glaſs alone becoming as uſeful to them, and ſometimes more than a Combination of Glaſſes. Communicated to the* Royal-Society, *by the Reverend* J. T. Deſaguliers, LL. D. *and* F. R. S.

Lemma I.

WHat is requir'd of a Teleſcope is to give large, and diſtinct Viſion; that is, to make the Object (as in *Galilæo's* Teleſcope) or its Image (as in the Teleſcopes made up of Convex *Lentes*) appear under a great Angle, and to have all the Rays of thoſe Pencils that enter the Eye, meet in a point upon the *Retina* of the Eye, on their reſpective Axes.

The firſt Figure repreſents the Combination of two Convex *Lentes* for the Aſtronomical or inverting Teleſcope; where the above-mentioned Requiſites are obtain'd. A B is the Object ſuppos'd at a vaſt diſtance from the Ojective *Lens* L L, ſo that Rays coming from the extremity A of the Object, will fall upon the *Lens* L L, in the ſame manner as if they were parallel to their Axis A X; and after paſſing the Glaſs unite at *a*, where they project the Image of the Point A; from whence diverging, they fall on the Eye-Glaſs *l l*, and having paſs'd through it, go on parallel to each other, and enter the *Cornea* of a common Eye E, which unites thoſe parallel Rays upon its *Retina* R R R at α, where the Image of *a* is projected: The ſame may be ſaid of the Rays that come from B, and after their

their ſeveral refractions through the two Glaſſes and the Coats and Humours of the Eye, meet upon the *Retina* at β, where they project the diſtinct Image of the Point *b*. The Rays that come from all the Points of the Object A B being affected after the ſame manner, give a diſtinct Image of thoſe Points upon the *Retina*, and therefore the Object does appear diſtinct.

The Object will alſo appear magnified in the ſame proportion as the Angle $l\,C\,l$ = to $b\,M\,a$ (under which its Image is ſeen,) is greater than the Angle A C B under which the Object A B would be ſeen by the naked Eye; as is more at large demonſtrated by Dioptrical Writers.

Lemma 2.

If parallel Rays fall upon the *Cornea* of a *Myops*, or ſhort-ſighted Perſon, they will unite in the Eye, before they come to the *Retina*, the farther from it the more Convex the Eye is; but if the Rays which fall upon the *Cornea* diverge in proportion to the too great Convexity of the Eye, as from D, ſuch Rays will be ſo refracted by the Coats and Humours of the Eye as to meet in one point upon the *Retina* R R, ſee *Fig.* 2 and 3. Where I have in the Scheme neglected the Refraction of the Rays paſſing out of the *Cryſtalline* K into the *Vitreous* Humour V, as I do in the other Caſes.

This *Lemma* is alſo demonſtrated by Dioptrical Writers.

Lemma 3.

If two Pencils of Rays (in each whereof all the Rays are parallel to the Axis, as *a* C) fall upon different Parts of the *Cornea*, at the greateſt diſtance from one another that can be allow'd for thoſe Rays to enter the Pupil P P, their *Axes* will, after entring the

Aqueous

Aqueous Humour, converge, and meet either in the Vitreous, or Cryſtalline Humour, according to the Convexity of the *Cornea* thro' which they paſs'd, and diverge again before they come to the *Retina*; the Rays of each Pencil converging upon their reſpective Axes, to the place where the ſaid Axes croſs one another, *Fig.* 4.

Demonſtration.

The Axes aCa, αCα, falling obliquely upon the *Cornea* at C, C, and entring from *Air* into the *Aqueous* Humour, will be refracted towards the Perpendicular to K: where ſtriking more directly upon the *Cryſtalline*, they will go on to α, a, upon the *Retina* RRRR, decuſſating at V within the *Vitreous* Humour. The other Rays r, r; ρ, ρ, after their Refraction in the *Aqueous* Humour, fall more obliquely on the *Cryſtalline*, and therefore are refracted again ſo as to meet at V, where the Axes alſo meet, and thence go on to the *Retina* RRRR, *Fig.* 4.

Lemma 4.

But if the Axes of the above-mention'd Pencils are Parallel, the Rays that accompany them diverging from a Point ſo near the Eye, that the divergence may be proportionable to the too great Convexity of the Eye; then only the Axes will meet in the Eye before they come to the *Retina* (by *Lemma* 3.) but the other Rays will not unite upon their reſpective Axes, till they come to the *Retina*, (by *Lemma* 2.)

Propoſition.

I ſuppoſe the Eye of the *Myops* ſo Convex that he can ſee no farther than a common Eye, with the Eye-Glaſs of a Teleſcope before it: then the Eye of the

Myops being in the place of the Eye-Glaſs, will receive the Rays diverging from the ſeveral points of the Image (projected by the Object-Glaſs in its *Focus*,) in ſuch manner, that they will after their ſeveral refractions meet in reſpective Points on the *Retina*; and the Axes of the Pencils which come from the extremities of the Object, will, in the Eye, make the Angle B V A = to *b c a*, under which the Image *a b* is ſeen, by *Lemma* 4. The *Cornea* and *Aqueous* Humour here ſupply the place of the Eye-Glaſs, and the *Cryſtalline* and *Vitreous* Humours that of a common Eye, See the 5th *Fig.* wherein R is the *Retina*, V the *Vitreous* Humour, and K K the *Cryſtalline* Humour; and the Image *b a* is ſuppos'd to be brought down from the *firſt Fig.* which repreſents the *Aſtronomick Teleſcope:* the too great Convexity of the Eye here being in the place of an Eye-Glaſs.

An Objection may be made to this, *viz.* that P P the Pupil of the Eye being ſmall, will take in but a very little Image, or a ſmall part of the Object: But then if the Eye be mov'd ſucceſſively, to all the parts of the Space where the Eye-Glaſs was, it can take any part of the Object; and if the Object-Glaſs be large, which may more eaſily be made than a large Eye-Glaſs, and the Tube a Foot wide or wider, as much may ſucceſſively be taken in, as if an Eye-Glaſs might be had of a Foot Diameter. A little practice may make any *Myops* ſo ready, as to keep an Object when once found, though the place where he ſtands be ſhaken. It would not be amiſs to hold a *Lens* in one's Hand (for an Eye-Glaſs) to find the Object at firſt, till cuſtom has made it eaſy without it: when once the Object is found, it may be eaſily kept.

An Eye more ſhort-ſighted than I have ſuppos'd, will perform the Office of a more Convex Eye-Glaſs, being

being brought nearer to the diſtinct Baſe of the Object Glaſs; and an Eye leſs Convex, the office of a leſs Convex Eye-Glaſs: but with this difference, that the more Convex the Eye is, the eaſier may any part of the Object be found, and the larger and more lucid it will appear.

I have ſeen *Saturn*'s Ring very plain with an Object-Glaſs of little more than ſix Foot *Radius*, without an Eye-Glaſs.

I have alſo found out a way for the *Preſbytæ* to make uſe of an Object-Glaſs, by placing their Eye nearer the *Lens* than its *Focus*, by ſo much as their Eye is flatter than a common Eye, ſo as to make (as it were) the Teleſcope of *Galilæo*; the flat Eye ſerving as a common Eye arm'd with a Concave *Lens*. I have ſo fixed the Teleſcope, as to make a *Preſbyta* read at a great diſtance a ſmall Print. The truth of this may be eaſily demonſtrated, if it be requir'd.

If this Experiment be made at Sea with a very large Tube, big enough to put in the Head and move it about, and the Object-Glaſs be alſo large, it may not perhaps be difficult to obſerve the Eclipſes of the *Satellites* of *Jupiter*, which I would recommend to the Conſideration of thoſe that would try for the Longitude by ſuch like Obſervations.

VI. *New and accurate Tables for the ready Computing of the* Eclipſes *of the* firſt Satellite *of* Jupiter, *by Addition only. By the Reverend Mr* James Pound, R. S. S.

IN *Numb.* 214. of theſe *Tranſactions*, for the Months of *Novem* and *Decem.* 1694. we exhibited an Epitomy of Mr. *Caſſini*'s curious Tables then newly pub-

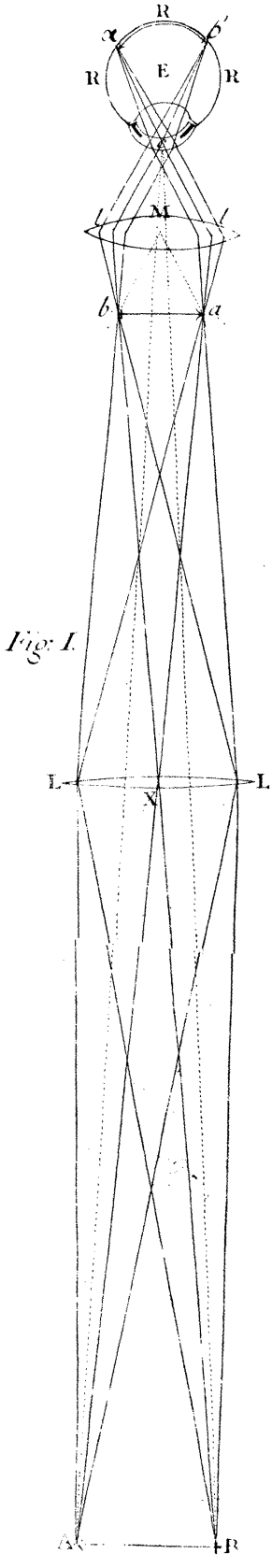
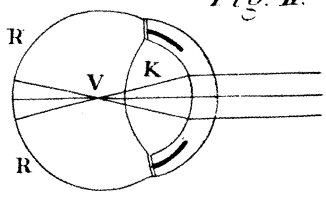


Fig: I.

Fig: II.



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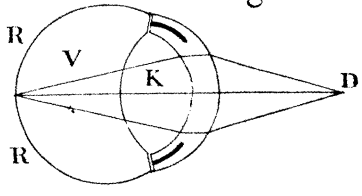

Fig: IV.

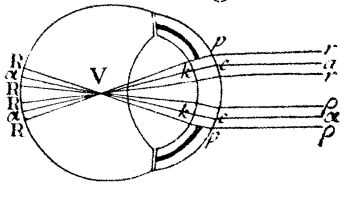

Fig: V.