the Vessel; and in a natural State they shut that Passage, and so prevent the Blood from recoiling into the same, if it should endeavour to return. But in this case, by reason of its contracted Narrowness and Thickness, not being able to close or shut the Passage, the Blood flowd back again into the Cavity, which it had gradually enlarged, and dilated to the Bigness we see. Besides the *Muscular Valves* not being duly qualified for the Performance of their Office, the Blood recoiled into the *Auricle*, which it had distended in the like manner. This constant Regurgitation or Reflux of the Blood is besides sufficient of its self, to produce this extraordinary trembling or παλμὸς καρδίας, as the *Greeks* call it.

IV. *A ready Description and Quadrature of a* Curve *of the* Third Order, *resembling that commonly call'd the* Foliate. *Communicated by Mr.* Abr. de Moivre, *F. R. S.*

I Have look'd a little farther into that Curve which fell lately under my consideration. It is not the *Foliate* as I did at first imagine, but I believe it ought not to make a *Species* distinct from it. AEB (*Fig.* 1.) is the Curve I thus describe. Let AB and BK be perpendicular to each other. From the point A draw AR cutting BK in R, and make $RE = BR$, the point E belongs to the Curve. Draw BC making an Angle of 45 *grad.* with AB, this Line BC touches the Curve in B; from the point E draw ED perpendicular to BC, and calling BD, x; DE, y; AB, a; and making $\sqrt{8aa} = n$, the Equation belonging to that Curve is $x^3 + xxy + xyy + y^3 = nxy$ or $\frac{x^4 - y^4}{x - y} = nxy$. Taking $BG = AB$, and drawing GP perpendicular to BG, PG is an *Asymptote*. In the *Foliate* the

the Equation is $x^3 + y^3 = \frac{1}{2} n x y$. in which the two Terms $xxy + xyy$ of the former Equation are wanting; and its *Asymptote* is distant from *B* by $\frac{1}{3}$ *B A*. Again draw *E F* perpendicular to *A B*: let *B F* be called *z* and *F E* *v*; the Equation belonging to the Curve *A E B* is $vv = \frac{azz - z^3}{a + z}$. In the *Foliate* the Equation is $vv = \frac{azz - z^3}{a + 3z}$ From these two last Equations it seems that these Curves differ no more from one another than the *Circle* from the *Ellipsis*. I should be very glad to know your Opinion thereupon.

The Quadrature of the Curve here described has something of Simplicity with which I was well pleased. With the Radius *B A* and Center *B* describe a Circle *A K G*, let the Square *H P S T* circumscribe it, so that *H P* be parallel to *A G*: prolong *F E* till it meet the Circumference of the Circle in *M*, and through *M* draw *L M Q* parallel to *H P*. The Area *B F E* is equal to the Area *K H L M*, comprehended by *K H*, *H L*, *L M* and the Arc *K M*. And the Area *B f e* is equal to the Area *KmLH* or *KMPQ*. Therefore if *B F* and *B f* are equal, the two Areas *B F E*, *B f e* taken together are equal to the Rectangle *H Q*, and therefore the whole Space comprehended by *B E A X B e T G Z* (supposing *T* and *Z* to be at an infinite Distance) is equal to the circumscribed Square *H S*.

N.B. *This Quadrature is easily demonstrated from the Equation: for by it* a + z : a − z :: zz : vv, *that is* A F : E F :: M F : F B, *and so* φ F *the* Fluxion *of* A F *to* L l *the* Fluxion *of* M F. *Hence the* Areola *E F φ e will be always equal to the* Areola M L l μ, *and therefore the* Area A E F *always equal to the* Area M A L.

Hence it appears that this Curve requires the Quadrature of the Circle to square it; whereas the Foliate *is exactly quadrable, the whole* Leaf *thereof being but one third of the Square of* A B, *which in this is above three sevenths of the same. Again*

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in our Curve, the greatest Breadth is when the Point F *divides the Line* A B *in extream and mean Proportion: whereas in the* Foliate *it is when* A B *is triple in power to* B F. *And the greatest* E F *or Ordinate in the* Foliate *is to that of our Curve nearly as* 3 *to* 4, *or exactly as* $\sqrt{\frac{2}{3}\sqrt{\frac{1}{3}}-\frac{1}{3}}$ *to* $\sqrt{5\sqrt{\frac{5}{4}}-5\frac{1}{2}}$.

But still these Differences are not enough to make them two distinct Species, *they being both defined by a like Equation, if the* Asymptote S G P *be taken for the Diameter. And they are both comprehended under the* fortieth Kind *of the* Curves *of the* third Order, *as they stand enumerated by Sir* Isaac Newton, *in his incomparable Treatise on that Subject.*

IV. *An easy Mechanical Way to divide the Nautical Meridian Line in* Mercator's *Projection; with an Account of the Relation of the same Meridian Line to the* Curva Catenaria. *By* J. Perks, M. A.

THE most useful Projection of the Spheric Surface of Earth and Sea for Navigation, is that commonly call'd *Mercator*'s; tho' its true Nature and Construction is said to be first demonstrated by our Countryman Mr. *Wright*, in his *Correction of the Errors in Navigation.* In this Projection the Meridians are all parallel Lines, not divided *equally*, as in the common plain Chart (which is therefore erroneous,) but the Minutes and Degrees (or strictly, the *Fluxions of the Meridian,*) at every several Latitude are proportional to their respective *Secants.* Or a Degree in the projected Meridian at any Latitude, is to a Degree of Longitude in the Equator, as the *Secant* of the same Latitude is to *Radius.*

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