

Ceterum totum cæli Planctarij spatium vel quiescit ( ut  
 vulgò creditur ) vel uniformiter movetur in directum et perinde  
 Planctarum commune centrum gravitatis ( per ~~Prop.~~<sup>Legem</sup> 4 ) vel  
 quiescit vel una movetur. Utroq; in casu motus Planctarum inter  
 se ( per ~~Prop.~~<sup>Legem</sup> 3 ) eodem modo se habent, et eorum commune centrum  
 gravitatis respectu spatij totius quiescit, atq; adeo pro centro immo-  
 -bili Systematis totius Planctarij haberi debeat. Inde vero systema  
 Coperniceum probatur a priori. Nam si in quovis Planctarum  
 sita computetur commune centrum gravitatis hoc vel incidet in  
 corpus Solis vel ei semper proximum erit. Eo Solis a centro  
 gravitatis errore fit ut vis centripeta non semper tendat ad  
 centrum illud immobile et inde ut planctæ nec moveantur in  
 Ellipsis exactè neq; his revolvant in eadem orbita. Tot sunt  
 orbite Planctæ cujusc; quot revolutiones, ut fit in motu Luna  
 et pendet orbita unaquæq; ab omnium Planctarum motibus  
 conjunctis, ut tacet eorum omnium actiones in se inbriem.  
 Tot autem motuum causas simul considerare et legibus exactis  
 calculum commodum admitterentibus motus ipsos definire superat  
 in fallor vim omnem humani ingenij. Omittè minutias illas et  
 orbita simplex et inter omnes errores mediocres erit Ellipsis  
 de qua jam egi. Siquis hanc Ellipsin ex tribus observationibus  
 per conspectum trigonometricum ( ut solent ) determinare tenta-  
 -rit, hic minus caute rem aggressus fuerit. Participabunt ob-  
 -servations illæ de minutis motuum irregularium hic neg-  
 -ligendis adeoq; Ellipsin de justa sua magnitudine et positione  
 ( que inter annos errores mediocres esse debet ) aliquantulum  
 deflectere facient, atq; tot dabunt Ellipses ab inbriem dis-  
 -crepantes quot adhibentur observationes trine. Coniungenda  
 sunt igitur et una operatione inter se conferenda observatio-  
 -nes quamplurimas, quæ se mutuo contemperent et Ellipsin  
 positione et magnitudine mediocrem exhiberant.

Prob. 4. Posito quod vis centripeta sit reciproè proportio-  
 -nalis quadrato distantie a centro, et cognita vis illius quantitate  
 requiritur Ellipsis quam corpus describat de loco dato cum  
 data aëritate secundum datam rectam emissum.

Vis centripeta tendens ad punctum  $P$  ea fit quæ corpus  $\pi$   
 in circulo  $\pi x$  contra  $p$  intervalla quovis  $Sp$  descripto gyrare  
 faciat. De loco  $P$  secundum lineam  $PR$  emittatur corpus  $P$ ,  
 et non.

Moreover, the whole space of the planetary heavens is either at rest (as is commonly believed) or moves uniformly in a straight line, and hence the common center of gravity of the planets (by Law 4) is either at rest or moves along with it. In either case the motions of the planets among themselves (by Law 3) are the same, and their common center of gravity is at rest with respect to the whole space, and thus can be taken for the immobile center of the whole planetary system.

Hence indeed the Copernican system is proved *a priori*. For if in any position of the planets their common center of gravity is computed, this either falls in the body of the Sun or will always be close to it.

By reason of the deviation of the Sun from the center of gravity, the centripetal force does not always tend to that immobile center, and hence the planets neither move exactly in ellipses nor revolve twice in the same orbit. Each time a planet revolves it traces a fresh orbit, as in the motion of the Moon, and each orbit depends on the combined motions of all the planets, not to mention the actions of all these on each other. But to consider simultaneously all these causes of motion and to define these motions by exact laws admitting of easy calculation exceeds, if I am not mistaken, the force of any human mind.

Omit these minutiae, and the simple orbit and mean among all the deviations will be the ellipse that I have already discussed. If any one tries to determine this ellipse by trigonometrical computation from three observations (as is customary), he will have proceeded without due caution. For those observations will share in the minute irregular motions here neglected and so make the ellipse deviate a little from its just magnitude and position (which ought to be the mean among all the deviations), and so will yield as many ellipses differing from one another as there are trios of observations to be employed. Therefore there are to be joined together and compared with one another in a single operation a great number of observations, which temper each other mutually and yield the mean ellipse in both position and magnitude.