De Gravitatione et aequipondio fluidorum et solidorum in fluidis scientiam duplici methodo tradere convenit. Quatenus ad scientias Mathematicas pertinet, aequum est ut a contemplatione Physicâ quàm maximè abstraham. Et hac itaque ratione singulas ejus propositiones e principijs abstractis et attendenti satis notis, more Geometrarum, strictè demonstrare statui. Deinde cùm haec doctrina ad Philosophiam naturalem quodammodo affinis esse censeatur, quatenus ad plurima ejus Phaenomena enucleanda accommodatur adeoque cùm usus ejus exinde praesertim eluceat et principiorum certitudo ~~conform~~ fortasse confirmetur, non gravabor propositiones ex abundanti experimentis etiam illustrare: ita tamen ut hoc laxius disceptandi genus in Scholijs dispositum, cum priori per Lemmata, propositiones et corollaria tradito non confundatur.

Fundamenta ex quibus haec scientia demonstranda est sunt vel Definitiones vocum quarundam ~~ut in quo sensu accipio noscatur~~; vel axiomata et postulata a nemine non concedenda. Et haec e vestigio tradam.

Definitiones.

Nomina quantitatis, durationis et spatij notiora sunt quàm ut per alias voces definiri possint.

Def: 1. Locus est spatij pars quam res adaequatè implet.

Def: 2. Corpus est id quod locum implet.

~~[illegible]~~

Def: 3. Quies est in eodem loco permansio.

Def: 4. Motus est loci mutatio.

Nota. Dixi corpus implere locum, hoc est ita saturare

ut res alias ejusdem generis sive alia corpora penitus excludat, tanquam res impenetrabilis. Potuit autem locus dici pars spatij cui res adæquatè inest, sed cùm hic corpora tantùm et non res penetrabiles spectantur, malui definire esse spatij partem quam res implet.

Præterea cum corpus hic speculandum proponitur non quatenus est substantia Physica sensibilibus qualitatibus prædita sed tantùm quatenus est quid extensum mobile et impenetrabile; itaque non definivi pro more philosophico, sed abstrahendo sensibiles qualitates (quas etiam Philosophi nisi fallor abstrahere debent, et menti tanquam varios modos cogitandi a motibus corporum excitatos tribuere) posui tantùm proprietates quæ ad motum localem requiruntur. Adeò ut, vice corporis Physici possis figuras abstractas intelligere quemadmodum Geometræ contemplantur cùm motum ipsis tribuunt, ut fit in prop 4 & 8, lib 1 Elem Euclid. Et in demonstratione definitionis 10mæ lib 11 debet fieri; siquidem ea inter definitiones perperam recensetur & potius inter propositiones demonstrari debuit, nisi fortè pro axiomate habeatur.

Definivi præterea motum esse loci mutationem, propterea quod motus, transitio, translatio, migratio &c videntur esse voces synonymæ. Sin malueris esto motus transitio vel translatio corporis de loco in locum.

Cæterum in his definitionibus cùm suppositum sit spatium a corpore distinctum dari, et motum respectu partium spatij istius, non autem respectu positionis corporum contiguorum determinari; ne id gratis contra Cartesianos assumatur, figmenta ejus tollere conabor.

Doctrinam ejus in sequentibus tribus propositionibus complecti possum. 1. Quod unicuique corpori unicus tantùm motus proprius ex rei veritate competit (Artic 28, 31 & 32 part 2 Princip) qui definitur esse Translatio unius partis materiæ sive unius corporis ex viciniâ eorum corporum quæ illud immediatè contingunt, et tanquam quiescentia spectantur, in viciniam aliorum. (Art 25 part 2, & Artic 28 part 3 Princip). 2do Quod per corpus proprio motu juxta hanc definitionem translatum non tantùm intelligitur materiæ particula aliqua vel corpus ex partibus inter se quiescentibus compositum, sed id omne quod simul transfertur, ubi rursus hoc ipsum constare possit ex multis partibus quæ alios inter se habeant motus. Art 25, part 2, Princip. 3o Quod præter hunc motum unicuique corpori proprium, innumeri etiam alij motus per participationem (sive quatenus est pars aliorum corporum alios motus habentium) possunt ipsi reverâ inesse (Art 31 part 2 Prin): Qui tamen non sunt motus in sensu philosophico & cum ratione loquendo (Art 29 part 3) & secundum rei veritatem (Art 25, part 2 & Art 28 part 3:) sed impropriè tantùm et juxta sensum vulgi (Art 24, 25, 28, & 31 part 2, & Art 29, part 3) Quod motum genus videtur (Art 24 part 2, & 28 part 3) describere esse actionem qua corpus aliquod ex uno loco in alium migrat.

Et quemadmodum duplices constituit motus, proprium nempe ac derivativos, sic duplicia loca assignat e quibus isti motus peraguntur, eaque sunt superficies corporum immediatè ambientium (Art 15 part 2), et situs inter alia quæcunque corpora (Art 13 part 2 & 29 part 3) ...

Jam verò quam confusa et rationi absona est hæc doctrina non modò absurdæ consequentiæ convincunt, sed et Cartesius ipse sibi contradicendo videtur agnoscere. Dicit enim Terram cæterosque Planetas propriè et juxta sensum Philosophicum loquendo non moveri, eumque sine ratione et cum vulgo tantùm loqui qui dicit ipsam moveri propter translationem respectu fixarum (Art 26, 27, 28, 29 part 3). Sed postea tamen in Terra et Planetis ponit conatum recedendi a Sole tanquam a centro circa quod moventur, quo per consimilem conatum Vorticis gyrantis in suis a Sole distantijs librantur Art 140 part 3. Quid itaque? an hic conatus a quiete Planetarum juxta Cartesii

Newton's "De Gravitatione ..."
Disposing of Descartes' *Figmenta*

Def 1. **Place is a part of space that a thing fills evenly.**

Def. 2. **Body is that which fills a place.**

Def. 3. **Rest is a continuance in the same place.**

Def. 4. **Motion is a change of place.**

***Reductio of Descartes, showing that his definitions of place, body, rest and motion are incompatible with his claims about vortices and uniform motion in a straight line*:**

"... it then follows that any moving thing has no determinate velocity and no definite line in which it is moved. And much more that the velocity of a body without impediment to its motion cannot be said to be uniform, nor the line straight in which the motion takes place. Nay rather that there can be no motion since there isnone without a certain velocity and determination.

Indeed it follows that Descartes' motion is not motion, seeing that it has no velocity, no determination and that by it no space and no distance is covered. It is necessary therefore that the assignment of places (and thus likewise local motion) should be referred to a certain immobile entity, such as extension or space alone in so far as it is regarded as something truly distinct from bodies."

Newton's "De Gravitatione ..."
On *force*, *conatus*, *inertia*, and *gravity*

Def 5. *Vis* (force) is the causal principle of motion and rest, and is either something external which, impressed in a certain body, either generates or destroys its motion, or at least to some extent changes it; or it is the internal principle by which the motion or rest imprinted on the body is conserved, and by which every entity endeavours to persevere in its actual state, and opposes itself to any impediment.

Def. 6. *Conatus* is an impeded force, or a force in so far as it is resisted.

Def. 7. *Impetus* is force in so far as it is impressed on something else.

Def. 8. *Inertia* is a force within a body, lest its state should be easily changed by an external exciting force.

Def. 10. *Gravitas* is a force in a body impelling it to decend. Here, however, by descent is not only meant a motion towards the centre of the Earth, but also towards any point or region, or even from any point. In this way if the *conatus* of the aether whirling about the Sun to recede from its centre be taken for gravity, the aether in receding from the Sun could be said to descend.

Def. 11. The *intensio* of any of the above mentioned powers is the degree of its quality.

Def. 12. Its *extensio* is the amount of space or time in which it operates.

Def. 13. Its *quantitas absoluta* is the product of its intension and extension. ... The intension of gravity is proportional to the specific gravity of the body; its extension, to the size of the heavy body; and speaking absolutely its quantity is the product of its specific gravity and bulk.