

- c. A potential source of independent evidence, though first must remove the impediment to such evidential reasoning raised in the Copernican Scholium
- 7. Midway through this letter of 12 January 1685 Newton makes an offhand remark worthy of note:

“Now I am upon this subject I would gladly know the bottom of it before I publish my papers.”
- B. Drafts of New Definitions: Absolutes
 - 1. The next manuscript we have is entitled *De Motu Corporum in Mediis Regulariter Cedentibus*, that is, "in uniformly yielding media," that consists only of preliminaries to a theory
 - a. A series of definitions -- akin to the series opening Part IV of *Horologium Oscillatorium* -- many of them reworked and with some inserts and number changes indicating a subsequent revision
 - b. Dates unclear, but sometime in the first half of 1685, likely before April
 - 2. The point of the 18 definitions is made clear at the end:

"The aim of explaining all these things at length is that the reader may be freed from certain vulgar prejudices and, imbued with the distinct principles of mechanics, may agree in what follows to distinguish carefully from each other quantities which are both absolute and relative, a thing very necessary since all phenomena depend on absolute quantities."

 - a. More than just a need for sophistication, for if phenomena depend on absolute quantities, must distinguish them from relative if going to achieve empirical refinements of initial simple theories
 - b. As he goes on to point out, the distinction also allows him to duck scriptural arguments (in much the way that Descartes wanted to)
 - 3. Absolute space presented not only as conceptually distinct from relative space, but also as empirically distinguishable
 - a. Newton's first argument is conceptual -- i.e. philosophical, for it claims only that we have such a concept and it is fundamentally presupposed by other concepts
 - b. Second argument, in Definition 4, is empirical: absolute and relative distinguishable by descent of heavy bodies (Newton's experiment again)
 - c. Note the felt need to argue for the definition: arguing for an empirical distinction, not for mere use of words
 - 4. Absolute motion versus relative motion: claim is that they are distinguishable, at least up to a point
 - a. Basic argument from *conatus a centro* (as in *De Gravitatione ...*)
 - b. Main point: because *conatus a centro* is certain and determinate, there is also some certain and determinate quantity of real motion in individual bodies
 - c. Reminiscent of Descartes, argues that forces acting on a body a basis for distinguishing between absolute and relative motion, for former requires force on body in question
 - d. To some extent the argument here amounts to saying that the whole way of conceptualizing motion, centered on the principle of inertia, presupposes a distinction between absolute and relative motion, and so the distinction gains warrant from the effectiveness of this conceptualization

- e. But then that distinction is going to be drawn in terms of the action of real forces in contrast to the actions of such apparent forces as the Coriolis force Newton has identified
5. The definition of quantity of motion is outwardly Cartesian, though presumably the reference to velocity makes it a vector quantity
 - a. Quantity of matter -- not solid matter -- here being distinguished from weight, though this is also done by Descartes
 - b. It "is to be estimated from the amount [*copia*] of the corporeal matter which is usually proportional to its gravity" -- "usually" leaves open the possibility that not always
 - c. (Remarks about pendulum experiments will be commented on below, in conjunction with the further Definitions)
 6. Definition of centripetal forces lists gravity ("tending to the centre of the earth!"), magnetic force tending to the center of the magnet (?), and "the celestial force preventing the planets from flying off in the tangents of their orbit"
 - a. Note that gravity and magnetism here distinguished from the celestial force
 - b. Centripetal force contrasted to innate or internal force – it is an impressed force
 - c. No distinction in any of the discussion of forces between impulse-like and continuous forces
- C. Drafts of New "Laws": The Third Law
1. The first two laws are in effect "Newton's first two laws", perhaps stated with more concern for clarity than in Version 3 of De Motu
 - a. Claim that Galileo employed these two laws to discover the parabolic trajectory of projectiles is, of course, open to question, as is the claim about experiments supporting it
 - b. The thing to notice here is that Newton is now feeling the need to offer some sort of explicit defense of the two laws
 - c. Question: what is defense supposed to show -- that the laws are true, that they are warranted, or that they are just reasonable?
 2. The third is "Newton's third law", to be found earlier in his work on impact in the Waste Book and in the Lucasian lectures on algebra (as in earlier handouts on impact)
 - a. The empirical arguments offered in its defense appear to be saying nothing more than that it is compatible with known empirical phenomena
 - b. The "derivation" of this law from Definitions 12 and 14, as Newton's explanation of the derivation shows, presupposes the main content of the law -- equal and opposite -- and hence does not add much
 3. In fact the third law goes together with the fourth and the fifth -- Laws 3 and 4 of De Motu Version 3; Newton remarks that they "mutually confirm each other", but offers no demonstration
 - a. The fifth law does most of the work in De Motu Version 3, but the claim it makes seems least open to any sort of comparatively direct empirical test