a. One provocation: Kepler's numbers for Saturn fail to conform with 3/2 power rule to the desired percision
b. Newton has obviously made a calculation of the deviation -- one or two solar radii, greatest the year before conjunction
c. Finally asks for precise radii of Jupiter satellite orbits vis-a-vis Jupiter's diameter, probably because trying to obtain comparative measures of (absolute) centripetal force

4. Flamsteed replies that he has no evidence of such an anomaly in Saturn's orbit, and that he thinks any anomalies in Jupiter's orbit can be eliminated via better orbital parameters than Kepler had
   a. Admits that he has yet to be strict enough with Saturn's orbit to "affirme that there is no such exorbitation as you suggest," and promises to look into the matter
   b. Expresses some amazement at the very idea of these two planets affecting one another across such a broad distance (from 5.2 AU in the mean for Jupiter to 9.6 AU for Saturn)
   c. Gives elongations of the satellites of Jupiter, as requested (clearly using a micrometer)
5. Newton's January 12 reply finds him puzzled by failure to observe an anomaly in the orbit of Saturn, but now indicating that calculations based on Flamsteed's numbers had shown him that Jupiter's "vertue is less than I supposed" (presumably, after conversion to full astronomical units)

   "Your information about ye error of Keplers tables for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or other unknown to me, wch might disturb ye sesquialtera proportion. For ye influences of ye Planets one upon another seemed not great enough tho I imagined Jupiter's influence greater than your numbers determin it."

   a. Main concern: apparent discrepancy too large to account for via interaction effect, and hence perhaps an indication of some further force at work
   b. Letter ends with request for best current orbital parameters "that I may see how the sesquiplicate proportion fills ye heavens together wth another small proportion wch must be allowed for," and says that he will get around to calculating the lines described by the comets of 1664 and 1680
   c. The reference to the small proportion is presumably to corrections that must be made to 3/2 power rule from two-body interaction effects: a^3/P^2 varies as $(1+c/C)$ – e.g. as $(1+C_j/C_h)$
   d. This small proportion provides basis for concluding that none of the planets for which the value cannot be inferred from satellites have an $[a^3/P^2]$ significantly greater than that of Jupiter, for if they did, the small proportion would be detectable!
6. Newton would appear to be pursuing a new line of evidential reasoning at this point: if can show that no other forces at work besides the inverse-square centripetal forces, then can use deviations from Keplerian motion -- especially deviations from planet interactions -- as evidence!
   a. Presumably as evidence in support of mutual interaction, and conclusion that inverse-square acclerations toward Jupiter and Saturn extend indefinitely far into space
   b. Thereby substantiating their effects on the sun

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