

versal gravitation, that the planets do not execute their movements in this insulated and independent manner. Each of them is acted on by the attraction of all the rest. The Earth is constantly drawn by Venus, by Mars, by Jupiter, bodies of various magnitudes, perpetually changing their distances and positions with regard to the earth; the Earth in return is perpetually drawing these bodies. What, in the course of time, will be the result of this mutual attraction?

All the planets are very small compared with the sun, and therefore the derangement which they produce in the motion of one of their number will be very small in the course of one revolution. But this gives us no security that the derangement may not become very large in the course of many revolutions. The cause acts perpetually, and it has the whole extent of time to work in. Is it not easily conceivable then that in the lapse of ages the derangements of the motions of the planets may accumulate, the orbits may change their form, their mutual distances may be much increased or much diminished? Is it not possible that these changes may go on without limit, and end in the complete subversion and ruin of the system?

If, for instance, the result of this mutual gravitation should be to increase considerably the eccentricity of the earth's orbit, that is to make it a longer and longer oval; or to make the moon approach perpetually nearer and nearer the earth every revolution; it is easy to see that in the one case our year would change its character, as we have noticed in the last section; in the other, our satellite might finally fall to the earth, which must of course bring about a dreadful catastrophe. If the positions of the planetary orbits, with respect to that of the earth, were to change much, the planets might sometimes come very near us, and thus exaggerate the effects of their attraction beyond calculable limits. Under such circumstances, we might have "years of une-