

Saturn. And in the same way, if the attraction of the Earth had any *specific* relation to different kinds of matter, the time of oscillation of a pendulum of equal length composed wholly or in part of the two substances would be different. If, for instance, it were more intense for magnetized iron than for stone, the iron pendulum would oscillate more quickly. Bessel showed<sup>1</sup> that it was possible to assume hypothetically a constitution of the sun, planets, and their appendages, such that the attraction of the Sun on the Planets and Satellites should be proportional to the quantity of matter in each; but that the attraction of the Planets on one another would not be on the same scale.

Newton had made experiments (described in the *Principia*, Book iii., Prop. vi.) by which it was shown that there could be no considerable or palpable amount of such specific difference among terrestrial bodies, but his experiments could not be regarded as exact enough for the requirements of modern science. Bessel instituted a laborious series of experiments (presented to the Berlin Academy in 1832) which completely disproved the conjecture of such a difference; every substance examined having given exactly the same coefficient of gravitating intensity as compared with inertia. Among the substances examined were metallic and stony masses of meteoric origin, which might be supposed, if any bodies could, to come from other parts of the solar system.

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## CHAPTER IV.

### VERIFICATION AND COMPLETION OF THE NEWTONIAN THEORY.

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#### *Tables of the Moon and Planets.*

THE Newtonian discovery of Universal Gravitation, so remarkable in other respects, is also remarkable as exemplifying the immense extent to which the verification of a great truth may be carried, the amount of human labor which may be requisite to do it justice, and the striking extension of human knowledge to which it may lead. I have said that it is remarked as a beauty in the first fixation of a theory that its measures or elements are established by means of a few

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<sup>1</sup> *Berlin Mem.* 1824.