

easy to leave out of sight all other effects of the vortex, and to consider only the central force; and when this was done, the Cartesian mathematician could apply to his problems a mechanical principle of some degree of consistency. This reflection will, in some degree, account for what at first seems so strange;—the fact that the language of the French mathematicians is Cartesian, for almost half a century after the publication of the *Principia* of Newton.

There was, however, a controversy between the two opinions going on all this time, and every day showed the insurmountable difficulties under which the Cartesians labored. Newton, in the *Principia*, had inserted a series of propositions, the object of which was to prove, that the machinery of vortices could not be accommodated to one part of the celestial phenomena, without contradicting another part. A more obvious difficulty was the case of gravity of the earth; if this force arose, as Descartes asserted, from the rotation of the earth's vortex about its axis, it ought to tend directly to the axis, and not to the centre. The asserters of vortices often tried their skill in remedying this vice in the hypothesis, but never with much success. Huyghens supposed the ethereal matter of the vortices to revolve about the centre in all directions; Perrault made the strata of the vortex increase in velocity of rotation as they recede from the centre; Saurin maintained that the circumambient resistance which comprises the vortex will produce a pressure passing through the centre. The elliptic form of the orbits of the planets was another difficulty. Descartes had supposed the vortices themselves to be oval; but others, as John Bernoulli, contrived ways of having elliptical motion in a circular vortex.

The mathematical prize-questions proposed by the French Academy, naturally brought the two sets of opinions into conflict. The Cartesian memoir of John Bernoulli, to which we have just referred, was the one which gained the prize in 1730. It not unfrequently happened that the Academy, as if desirous to show its impartiality, divided the prize between the Cartesians and Newtonians. Thus in 1734, the question being, the cause of the inclination of the orbits of the planets, the prize was shared between John Bernoulli, whose Memoir was founded on the system of vortices, and his son Daniel, who was a Newtonian. The last act of homage of this kind to the Cartesian system was performed in 1740, when the prize on the question of the Tides was distributed between Daniel Bernoulli, Euler, Maclaurin, and Cavallieri; the last of whom had tried to patch up and amend the Cartesian hypothesis on this subject.