in *An Attempt to prove the Motion of the Earth from Observations*, published in 1674. In this, he distinctly states that the planets would move in straight lines, if they were not deflected by central forces; and that the central attractive power increases in approaching the centre in certain degrees, dependent on the distance. "Now what these degrees are," he adds, "I have not yet experimentally verified;" but he ventures to promise to any one who succeeds in this undertaking, a discovery of the cause of the heavenly motions. He asserted, in conversation, to Halley and Wren, that he had solved this problem, but his solution was never produced. The proposition that the attractive force of the sun varies inversely as the square of the distance from the centre, had already been divined, if not fully established. If the orbits of the planets were circles, this proportion of the forces might be deduced in the same manner as the propositions concerning circular motion, which Huyghens published in 1673; yet it does not appear that Huyghens made this application of his principles. Newton, however, had already made this step some years before this time. Accordingly, he says in a letter to Halley, on Hooke's claim to this discovery,[23] "When Huygenius put out his *Horologium Oscillatorium*, a copy being presented to me, in my letter of thanks I gave those rules in the end thereof a particular commendation for their usefulness in computing the forces of the moon from the earth, and the earth from the sun." He says, moreover, "I am almost confident by circumstances, that Sir Christopher Wren knew the duplicate proportion when I gave him a visit; and then Mr. Hooke, by his book *Cometa*, will prove the last of us three that knew it." Hooke's *Cometa* was published in 1678. These inferences were all connected with Kepler's law, that the times are in the sesquiplicate ratio of the major axes of the orbits. But Halley had also been led to the duplicate proportion by another train of reasoning, namely, by considering the force of the sun as an emanation, which must become more feeble in proportion to the increased spherical surface over which it is diffused, and therefore in the inverse proportion of the square of the distances.[24] In this view of the matter, however, the difficulty was to determine what would be the motion of a body acted on by such a force, when the orbit is not circular but oblong. The investigation of this case was a problem which, we can

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[23] *Biog. Brit.*, art. *Hooke*.

[24] Bullialdus, in 1645, had asserted that the force by which the sun "prehendit et harpagat," takes hold of and grapples the planets, must be as the inverse square of the distance.