OUT OF THE SHADOW OF A GIANT, HOOKE, HALLEY & THE BIRTH OF SCIENCE BY JOHN GRIBBIN AND MARY GRIBBIN

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In 1988 a meeting was held at the London Royal Society covering the remarkable achievements of Robert Hooke, followed several years later by a celebration of his tercentenary at Gresham College, in London.[2]. In the past, Hooke's achievements had been mostly forgotten, but now about half a dozen books about his life and work have appeared, one of which aptly named him the Leonardo of London [3]. For example, after receiving a copy of Hooke's influential masterpiece, the *Micrographia*, one of his contemporaries, Samuel Pepys, declared that he "sat untl 2 a-clock in my chamber reading of Mr. Hooke's Microscopically Observations, the most ingenious book that ever I read in my life".

Now John and Mary Gribbin have written yet another Hooke biography that includes an account of his famous contemporary, Edmund Halley. Their book covers much the same material as others, but differs by heavily denigrating Isaac Newton, making some outlandish accusations about him that are demonstrably false. Already in their preface (pg. xii) these authors claim that it has been "established" that the famous story of the fallen apple "is a myth invented by Newton to bolster his (false) claim that he had the idea of a universal theory of gravity before Hooke". But according to one of the most renowned 17th century British mathematicians, David Gregory, who visited Newton at Cambridge in 1694, he remarked: "I saw a manuscript written before the year 1669 (the year when its author was made Lucasian Professor of Mathematics) where all the foundations of his philosophy are laid: namely the gravity of the Moon to the Earth and of the Planets to the Sun. And in fact all these even then are subjected to calculation." This manuscript, still in existence, is reproduced in J. Herivel's book on the background of Newton's *Principia* [4], and it shows that Newton had estimated the Earth's gravitational attraction of the Moon by deriving the inverse square law dependence from Kepler's third law (that the square of a planet's period is proportional to the cube of its distance from the Sun). But neither Hooke, nor his contemporaries, Wren and Halley, with whom he discussed this subject were able to support their assumption of the inverse square gravitational law. Hooke conjectured that gravitational forces account for the motion of planets around the Sun, and published his ideas in a 1674 short track (28 pages long), leaving out the question of the spatial dependence of this force, by claiming that " having many other things in hand . . . and therefore cannot so well attend it" [5].

About five years later, Hooke approached Newton, essentially to request his help to establish the laws of gravity on a sound physical and mathematical basis. He wrote that "I doubt not but that by your excellent method you will easily find what that Curve must

be, and its proprietys, and suggest a physical reason of this proportion . . .” [6]. This contact appears to have reignited Newton interest in this subject, during a period when he appeared to have been mainly occupied with his alchemical experiments. In an exchange of six letters, Newton sent Hooke a diagram showing a non-periodic orbit he had calculated under the action of an unspeciified force. Hooke responded that he had observed such an orbit in a ball rolling in an inverted cone [7], [8]. In the text of this letter Newton also indicated the existence of a central force that led to a periodic orbit, but he did not reveal its spatial dependence. But the Gribbins claim that “before he received this package of ideas, Newton’s world - view was very much what you would expect from a mystic alchemist and crackpot theologian”, and a “backward looking mystic with a head filled with magical mumbo-jumbo” (pg. 166-7). A few years later, however, when Halley visited Newton to inquire “what he thought the Curve would be that would be described by the Planets supposing the force of attraction towards the Sun to be reciprocal to the square of their distances from it, Sir Isaac replied immediately that it would be an Ellipsis”. But when Halley asked for his calculation, Newton responded that he could not find it but “promised to renew it, and then send it to him”. The Gribbins claim that “Newton was playing for time by pretending he had already made the calculation” (pg .171). Instead, this encounter and a subsequent visit by Halley prompted Newton to start writing up his work which culminated with the *Principia*, undoubtedly one the most spectacular and influential scientific book ever written.

In his old age, one of the great astrophysicist in the second half of the 20th century, S. Chandrasekhar, remarked that he had an epiphany after reading the *Principia*, finding so many excellent and insightful theorems and results in this book. It is well known that Newton could not accept any criticism, of his work, and he unfairly denied Hooke any credit for his contributions to the development of the theory of gravitation. But in their book, John and Mary Gribbin claim that Newton was a “serial plagiarist” (pg. 71), and in one of their most outlandish remarks, that “it is not far from the truth” that Newton “had only one good idea in his lifetime” (pg.179). If one wants to avoid the irritation caused by such ridiculous comments, and similar ones spread elsewhere in this book, it is better not to read it.

References

[1] “Robert Hooke, New Studies. Edited by M. Hunter and S. Schaffer (Boydell Press, Woodbridge, 1989)
[2] “Robert Hooke, Tercentenial Studies. Edited by M. Cooper and M. Hunter (Ashgate Publishing, 2006)
[3] J. Bennett, M. Cooper, M. Hunter and L. Jardine, “ London’s Leonardo: The Life and Work of Robert Hooke” (Oxford, 2003)
[4] J. Herivel , “The Background to Newton’s *Principia*: A Study of Newton’s Dynamical Researches in the Years 1664-84) (Oxford, 1996) pp. 192-198
[5] R. Hooke, “ An Attempt to Prove the Motion of the Earth from Observations” (London, Printed by T.R for John Maryn Printer to the Royal Society at he Bell in Saint Paul’s Church Yard, 1674)
[6] M, Naueberg, “Hooke, Orbital Motion, and Newton’s *Principia*. American Journal of Physics, **62** No.4 (April 1994)331-350.
[7] J. Pelseneer, “ Une lettre inédit de Newton”, Isis **1** (1929) 237-254. This important letter is reproduced in ‘The Correspondence of Isaac Newton, Vol II , 1676-1687, edited by H.W. Turnbull (Cambridge

Univ. Press 1960) 307-308. Pelseener wrote: "Il est certain que Hooke n'a pas toujours su franchir la distance enorme qui separe les intuition heurese des demonstrations certains. (It is certain that Hooke could never cross the enormous distance that separates happy intuition from demonstrations that are certain.

[8] video reenacting Hooke's rolling ball experment and Newton's drawing based on his calculation of this trajectory: www.youtube.com/watch?v=x8I0Es4Fc94

[9] M. Nauenberg, " Hooke's and Newton's contributions to the early development of orbital dynamics and the theory of universal gravitation", Early Science and Mediciine, Vol. X, No, 4 (2005)d 518-528