Thomas Hobbes

Born: 5 April 1588 in Westport, Malmesbury, Wiltshire, England
Died: 4 Dec 1679 in Hardwick Hall, Derbyshire, England

Thomas Hobbes's father, also named Thomas Hobbes, was the vicar of Charlton and Westport, close to Malmesbury in Wiltshire. Thomas Hobbes senior was described by Aubrey in [13] as:-

... one of the ignorant Sir Johns of Queen Elizabeth's time; could only read the prayers of the church and the homilies; and valued not learning, as not knowing the sweetness of it.

Thomas Hobbes senior had an older brother, Francis Hobbes, who was a wealthy merchant with no family of his own. Thomas Hobbes, the subject of this biography, had one brother Edmund who was about two years older than he him. Thomas began his schooling in Westport Church when he was four years old. However, when he was seven years old, his father had an argument with another vicar at the door of his church. Blows were exchanged and Hobbes' father ran off. It is unclear what role his mother played in his upbringing after that, but he was certainly brought up by his uncle Francis after this.

From age eight Hobbes, who was by this time proficient at reading and arithmetic, attended Mr Evan's school in Malmesbury, then later Robert Latimer's private school in Westport. Hobbes showed his brilliance at this school and was an outstanding Greek and Latin scholar by the time he left this school at age fourteen, having already translated Euripides' *Medea* from Greek into Latin iambics. Aubrey in [13] tells us that as a young boy Hobbes was sometimes playful, but also sometimes withdrawn and melancholy. Often at school [13]:-

... he would get himself into a corner, and learn his lesson by heart.

After leaving Robert Latimer's school, he entered Magdalen Hall, Oxford in 1603 where he continued to be supported financially by his uncle Francis. At that time the teaching at Oxford was dominated by a study of Aristotle and Hobbes soon found that his opinions differed sharply from what was being taught [13]:-

He did not much care for logic, yet he learned it, and thought himself a good disputant. He took great delight there to go to the bookbinders' shops and lie gaping on maps.

He graduated with a B.A. in 1608 and on the recommendation of Sir James Hussey, Principal of Magdalen Hall, he became the tutor of William Cavendish, later the Second Earl of Devonshire. For around two years Hobbes did little in the way of academic studies, being more of a companion to Cavendish who was only a little younger that he was. In 1610 Hobbes went with Cavendish on a European tour and they visited France, Germany, and Italy. He learnt French and Italian on this trip, but more importantly, it reinvigorated his desire for learning and he decided that he would pursue a study of classics. On his return Hobbes took up studying Greek and Latin again. He had progressed from being a tutor to Cavendish to being his secretary and having few duties he had plenty of time to devote to his studies.

In 1626, on the death of his father, William Cavendish inherited the title the Earl of Devonshire, but two years later William died and Hobbes lost a friend as well as his secretarial post. William Cavendish's son was only eleven years old and Hobbes' services were no longer required by the Cavendish family at this time.

Hobbes was tutor to the son of Sir Gervase Clinton of Nottinghamshire, from 1628 to 1631. During this period, in 1629, he published his translation of Thucydides which he had been working on for several years. So far we

have not mentioned any interest by Hobbes in mathematics, and perhaps even more surprisingly no particular interest in philosophy. In fact Hobbes was about forty years old before he became fascinated by mathematics. Although Aubrey's description of Hobbes encountering mathematics for the first time is, like so much of Aubrey, rather overdone, nevertheless his description in [13] is well worth recording:-

He was forty years old before he looked on geometry; which happened accidentally. Being in a gentleman's library Euclid's Elements lay open, and 'twas the forty-seventh proposition in the first book. He read the proposition. 'By God,' said he, 'this is impossible!' So he reads the demonstration of it, which referred him back to such a proof; which referred him back to another, which he also read. ... at last he was demonstratively convinced of that truth. This made him in love with geometry.

He undertook a second trip to the continent from 1629 to 1631 with his new pupil. In 1631 the Cavendish family requested his services again and he returned from Paris to become tutor to the third Earl of Devonshire, a position he held from 1631 to 1642. During this time he again visited the continent, being there from 1634 to 1637. On the continent he met Galileo, Mersenne, Gassendi and Roberval and became enthusiastic about the mechanical universe and began building his philosophical position relating everything to motion. In fact his views at this time appeared to be very much in line with the latest scientific ideas of the period. Back in England in 1637 Hobbes worked on *The Elements of Law, Natural and Politic* which was not published at the time. He described his mechanistic approach to perception in this work as follows:-

Whatsoever accidents or qualities our senses make us think there be in the world, they be not there, but are seemings and apparitions only; the things that really are in the world without us, are those motions by which these seemings are caused.

When the Civil War began in 1640 Hobbes feared for his life, especially as he was a well known Royalist, and he fled to save his life. He lived in Paris from 1640 where again he made contact with Mersenne's circle of scholars. There he wrote his objections to Descartes' *Meditations* and he published *De Cive* (Concerning Citizenship) in 1642 which contained his ideas on the relation between the church and the state. After this he worked on optics, which was one of his favourite topics. Malet [28] writes:-

Hobbes's theory of optical images [*was*] *developed in his optical magnum opus "A minute of first draught of the optiques"* (1646) *and published in abridged version in "De homine"* (1658). *... Hobbes's theory of vision and images serves him to ground his philosophy of man on his philosophy of body. Furthermore, since this part of Hobbes's work on optics is the most thoroughly geometrical, it reveals a good deal about the role of mathematics in Hobbes's philosophy.*

Hobbes published a new expanded edition of *De Cive* in 1647, then three years later, in 1650, his earlier work *The Elements of Law, Natural and Politic* was published without his permission. It appeared in two parts as *Humane Nature* (Human nature) and *De Corpore Politico* (Of the body politic).

Hobbes was the mathematics tutor of the Prince of Wales between 1646 and 1648. He remained on the continent until 1651, the year his most famous work *Leviathan* was published then, late in that year, he returned to England. In fact he was now in some difficulties with all sides of the political spectrum. In England the Royalists, with Charles I dead, seemed to have lost their struggle for power. Passages near the end of the *Leviathan* appeared to indicate that Hobbes was trying to make his peace with the English government, which angered the Royalists. In fact in these passages Hobbes was remaining consistent with his view that one showed allegiance to a ruler only so long as that ruler could provide protection. Hobbes had also attacked the Roman Catholic Church which made his position in Paris pretty untenable.

Hobbes' masterpiece *Leviathan* set out his ideas with great clarity. He argued that people want to live in peace and security and to attain this they must organise themselves into communities for protection. Since there will always be some in the community who cannot be trusted, people must set up a government with their authority to make and enforce laws necessary to protect the community. It is, Hobbes argues, the rational way for people

to behave so moral behaviour is rational. Although Hobbes was himself a Christian, these arguments were seen as many as removing the need for God as the giver of moral code, for Hobbes argues that it follows by reason alone. Another aspect of the work which caused many to attack it was Hobbes' vitriolic arguments against the university system.

Before this Hobbes had been seen by many as promoting a mechanistic scientific approach which was much in tune with those who would form the Royal Society. Indeed he had argued that since what we know and understand only comes through our senses and all objects that our senses can detect are material, we can only view the world in a material way. He promoted an approach through language and mathematics to analyse experience which he claimed would lead to a complete mechanistic understanding of the world. The certainty of mathematics would lead to correct and indisputable conclusions about society and about man. His argument that all was material was seen as denying the existence of the immaterialistic soul and intellect. Seth Ward, the Savilian Professor of Astronomy at Oxford, wrote:-

... he hath much injured the mathematics, and the very name of demonstration, by bestowing upon it some of his discourses, which are exceedingly short of that evidence and truth which is required to make a discourse able to bear that reputation.

At this stage, however, although Hobbes had published little in the way of mathematics, he certainly was considered by some as a leading mathematician on a par with Roberval and Fermat.

In 1655 Hobbes published *De Corpore* (On the Body) which, was one part of his trilogy of philosophy. He had already published *De Cive* (1642) and the third part, *De Homine* (On man), would appear in 1658. *De Corpore* contained a large amount of mathematical material; in fact Chapters 12 to 20 are devoted entirely to the topic. Hobbes saw mathematics as an essential part of knowledge, but he also saw his own materialistic approach as revolutionising the subject and he set out to reform mathematics in this work. His approach is certainly consistently materialistic, denying abstract ideas; for Hobbes mathematics is the study of quantity, and quantities are the measures of 3-dimensional bodies. His definition of a point in *De Corpore* (which totally differs from that of Euclid) is as follows:-

If the magnitude of a body which is moved (*although it must always have some*) *is considered to be none, the path by which it travels is called a line, and the space it travels along a length, and the body itself is called a point. This is the sense in which the earth is usually called a point and the path of its annual revolution the ecliptic line.*

Lines, therefore, are the paths of moving points, surfaces are the paths of moving lines, volumes are the result of moving surfaces. He then proceeded to study ratios and angles, then acceleration, projectiles and the ideas of Galileo followed by a study of indivisibles and the ideas of Cavalieri, the rectification of the spiral, and finally squaring the circle. It is fair to say that much of Hobbes' mathematical ideas are generalised from Galileo's study of mechanics and of motion. The new method of indivisibles, as put forward by Cavalieri, was accepted by Hobbes but he rejected Wallis's version as given in *Arithmetica infinitorum.*

Jesseph writes of Hobbes' attempt to square the circle [5]:-

... it is clear that he hoped to assert preeminence in the learned world largely on the basis of the solution of the problem of squaring the circle.

Hobbes had originally planned *De Corpore* without this result and, having added it late on, it did not really fit with the material surrounding it. Before *De Corpore* reached completion, however, Hobbes' friends pointed out an error in his squaring the circle argument. Hobbes did not remove the "proof" but renamed it "From a false hypothesis, a false quadrature". He then added a second proof which he quickly changed to only claim it was "an approximate quadrature". Finally he attempted a third exact proof but when the book was being printed he

realised that it too, of course, was wrong. He had to leave the incorrect claim but added at the end of the chapter:-

... the reader should take those things that are said to be found exactly of the dimension of the circle ... as instead said problematically.

This was a phrase that Wallis would pour scorn on when he attacked Hobbes' ideas. Although Hobbes did not believe that the "proofs" in *De Corpore* proved the result, he would go on to publish several "proofs" of squaring the circle over the next 25 years which he did believe to be correct.

Wallis attacked the whole of Hobbes' mathematical work of *De Corpore* and a vigorous argument between the two arose which lasted for 25 years. To Hobbes mathematics was geometry and only geometry, and Wallis's *Algebra* he described as:-

... a scab of symbols [*which disfigured the page*] *as if a hen had been scraping there.*

Hobbes claimed that the algebraic symbols could denote different things such as lines, surfaces or volumes, and therefore were unreliable in mathematical proofs. Hobbes responded to the attack by Wallis and others of *De Corpore* by publishing *Six Lessons to the Professors of Mathematics in the University of Oxford* in 1656.

In 1660 Hobbes attacked the 'new' methods of mathematical analysis. In *Dialogus Physicus, sive de Natura Aeris* (1661) he attacked Boyle and those setting up the Royal Society which, as a matter of interest, never elected Hobbes as a Fellow (it is probably that since he was perceived as an atheist entry would have been impossible). Wallis replied with telling mathematical arguments, but also with unfair charges of disloyalty. Hobbes ended the argument about disloyalty with *Mr. Hobbes Considered in His Loyalty, Religion, Reputation, and Manners* (1662). Hobbes could win arguments when his morality was attacked, but when it came to mathematics Wallis had a clear upper hand understanding mathematics far more deeply than Hobbes.

Over the years Hobbes attempted to solve a number of outstanding mathematical problems. Jesseph, in [22], studies:-

... Hobbes's attempts to resolve three important mathematical controversies of the seventeenth century: the debates over the status of analytic geometry, disputes over the nature of ratios, and the problem of the 'angle of contact' between a curve and tangent.

Although Hobbes is highly regarded as a philosopher, his mathematics has been essentially laughed at. However some have seen more in it than just errors. De Morgan wrote that Hobbes:-

... was not the ignoramus in geometry that he is sometimes supposed. His writings, erroneous as they are in many things, contain acute remarks on points of principle.

Grant, in [21], evaluates Hobbes' mathematical contributions and concludes that he was:-

... an amateur of mathematics in the original and best sense of the word, and through his role as a minor stimulant of others' success he merits a modest place in its annals.

Hobbes defended his mathematical works to the end of his life. His errors were demonstrated so clearly that by 1670 essentially everyone considered him a mathematical illiterate, yet still he wrote articles in his defence even though it is doubtful whether anyone continued to read them. Let us end with the summary of what Hobbes believed that he had achieved in mathematics, written near the end of his life. Hobbes writes about himself in the third person (see for example [5]):-

In mathematics, he corrected some principles of geometry. he solved some most difficult problems, which had been sought in vain by the diligent scrutiny of the greatest geometers since the very beginnings of geometry; namely these:

1. *To exhibit a line equal to the arc of a circle, and a square equal to the area of a circle, and this by various methods.*
2. *To divide an angle in a given ratio.*
3. *To find the ratio of a cube to a sphere.*
4. *To find any number of mean proportionals between two given lines.*
5. *To describe a regular polygon with any number of sides.*
6. *To find the centre of gravity of the quadrant of a circle.*
7. *To find the centres of gravity of all types of parabolas.*

He was the first to construct and demonstrate these, and many other things besides, which (*because they will appear in his writings are less important*) *I pass over.*

He was 91 years of age when he died, a remarkable age for someone in that period. At age 87 he completed translating the Iliad and the Odyssey into English verse and left London, where he had lived for many years, and spent his final years with the Cavendish family with whom he had been so closely connected throughout his life. At age 91, shortly before his death, he was working on yet another book on squaring the circle. The dedication contains the sentence:-

And so, after I had given sufficient attention to the problem by different methods, which were not understood by the professors of geometry, I added this newest one.

His final words are reported to have been:-

I am about to take my last voyage, a great leap in the dark.

Let us end this biography with a final thought. If Hobbes' mathematics was worthless why has so much effort been expounded on it even in the last few years (as the references show). There is no doubt that Hobbes' mathematics is wrong, but strangely, that does not seem to make it worthless! As a philosopher he was a leading figure, having a major influence on political thought.

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