

The Reverend Thomas Bayes FRS: a Biographical Sketch

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Thomas Bayes, from whom Bayes Theorem takes its name, was probably born in 1701 so that the year 2001 would mark the 300th anniversary of his birth.

Bayes came from a wealthy family that had made its fortune in the manufacture of cutlery in Sheffield, Yorkshire. By Thomas's generation the family's wealth was tied up in investments, such as mortgages and bank annuities, rather than trade, and the family had moved to London. It was also a family with strong Presbyterian connections. Thomas was the eldest child of Joshua Bayes (1671 – 1746), an eminent divine who ministered at two Presbyterian chapels in London. As the eldest son, Thomas Bayes was destined for the ministry. His male siblings followed career paths typical of the family's station in society: the second son entered the law and the younger sons went into trade, one as a linen draper and the other a grocer.

As a Presbyterian, and non-adherent to the established Church of England, Bayes was not allowed to attend Oxford or Cambridge. Instead, Bayes went outside English jurisdiction and attended the University of Edinburgh, beginning in 1720. He entered Divinity Hall at Edinburgh to study theology and left in 1723 without taking a degree, which was not untypical of the time. Before leaving Edinburgh, Bayes was licensed as a preacher but not ordained to the ministry, which probably occurred when he returned to London. In addition to theology, Bayes studied logic, history and mathematics during his first year at Edinburgh. He also knew Latin, Greek and French. Bayes's professor of mathematics was James Gregory (d. ca 1725), who was a member of a distinguished family of mathematicians. Though this Gregory was a capable mathematician, he was one of the lesser lights in the family.

After leaving Edinburgh, Thomas Bayes returned to London. By 1728 he was an ordained minister, and subsequently he became an assistant to his father at his chapel in Leather Lane, London. Similar to many Presbyterians in the 18th Century, Bayes drifted from orthodoxy in his religious beliefs. His heterodox views were over the Christian doctrine of the Trinity. It is likely that Bayes held Arian views. This may be described briefly as: the second part of the Trinity, God the Son or Jesus was an eternal being, but a lesser god to the first part of the Trinity, God the Father. While in London Bayes published anonymously his first and only known theological work, entitled *Divine Benevolence* ([Bayes], 1731). In this work, Bayes was trying to answer the question of the motivating source of God's actions in the world. The tract was written in response to a Church of England theologian, Dr. John Balguy who claimed the motivation was rectitude. Bayes, instead, attributed it to God's goodness or benevolence. A third voice joined the fray and argued that the source of divine action was wisdom rather than rectitude or goodness. By today's standards the

During his own lifetime Bayes was probably better known for his work in infinite series and numerical analysis than for his work in probability. Like his work in probability, Bayes' s only publication in infinite series was posthumous (Bayes, 1763b). Dale (1991) has described Bayes' s work in infinite series that appears in a notebook that he kept. The Bayes manuscripts in the Centre for Kentish Studies hint that one of the motivations behind Bayes' s interest in infinite series was Maclaurin' s (1742) derivation of Stirling' s approximation to $n!$ Maclaurin had based his approximation on an infinite series that Bayes (1763b) later had shown not to converge. One of the manuscripts shows an early version of the published paper and another shows Bayes giving an alternate derivation of Stirling' s approximation.

Over the 1740s and 1750s Bayes appears to have grown into the role of critic or commentator for a network of mathematicians that initially centered on Stanhope and perhaps later on John Canton. In 1755 Bayes was asked by Stanhope to comment on a paper by another mathematician, Patrick Murdoch; Stanhope forwarded Bayes' s comments to Murdoch. A letter from Bayes to John Canton, probably written also in 1755, is a commentary on some published results by Thomas Simpson (Simpson, 1755). It is also the first indication of Bayes' s interest in probability. Stigler (1986) has speculated that it was Simpson' s 1755 publication related to the law of large numbers that sparked Bayes' s interest in probability. The Stanhope papers support this speculation in that neither Stanhope nor his correspondents mention Bayes' s name when the subject of probability is raised.

Bayes' s fame rests on his work in probability (Bayes, 1763a). The paper was published only because Bayes' s friend, Richard Price went through Bayes' s papers after his death and thought the paper worthy of publication. The problem that Bayes considered is not what we know today as Bayes Theorem. The problem expressed by Bayes (1763a) was: "Given the number of times in which an unknown event has happened and failed: Required the chance that the probability of its happening in a single trial lies somewhere between two degrees of probability that can be named." Stigler (1986) and Dale (1999) have given full descriptions of Bayes' s solution to this problem. To obtain the solution to his problem Bayes considered a model table on which balls were rolled across it, coming to rest with equal chance at any spot on the table. The model table is possibly based on an early billiard table that originally was without pockets. Since the 17th Century, the table has been at Knole, a stately home in Sevenoaks about 12 miles from Tunbridge Wells.

Bayes may have suffered from rheumatism. This may explain the reason that he stayed in Tunbridge Wells, famous for its "medicinal" waters, after he left the ministry of Mount Sion chapel. In 1755 he was ill, perhaps seriously, with an unspecified ailment. He may have been ill again in December of 1760 when he signed his will. Four months later, Bayes died (April 7, 1761). The newspaper reports state only that his death was sudden so that the possible cause of his death was a heart attack. A heart attack would be consistent with rheumatism, particularly acute rheumatism. His body was taken from Tunbridge Wells to Founder' s Hall, a Scots Presbyterian chapel in London. He was buried in the Bayes family vault in Bunhill Fields cemetery in London. The vault, restored in the 1960s, may still be seen today.

What was Bayes like as a person? Holland (1962), based on his own research, concluded that

Bayes was a “quiet man, of earnest thought and abiding faith and of immense intellectual stature..” My own assessment differs somewhat from Holland. Based on the fact that he denied the pulpit to others, especially on Easter Day, says something of his strength of resolve rather than his quietness. His work as a referee or critic of other mathematical research, which was not done anonymously shows a certain confidence in his own abilities and work. As a critic of others, he was very insightful. His intellectual stature may not have been immense, but he was recognized as an excellent mathematician. Finally, his faith may not have been wholly abiding if he drifted from orthodox Presbyterianism to Arianism. Rather, it shows a willingness to question his faith seriously.

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RESUME

L' auteur raconte la vie et décrit les oeuvres de Thomas Bayes (1701? – 1761), mathématicien et pasteur.