John ARBUTHNOT
b. 29 April 1667 - d. 27 February 1735

Summary. A physician and writer, the creator of John Bull, John Arbuthnot is known in statistics for his translation of Huygens' book on probability and for the first use of a test of significance.

In assessing the eminent writers from the time of Queen Anne (1702 - 1714), James Boswell during the 1760's quoted the English lexicographer and writer Samuel Johnson as saying, "I think Dr. Arbuthnot the first man among them. He was the most universal genius, being an excellent physician, a man of deep learning, and a man of much humour." (*Boswell's Life of Johnson*)

By profession, Arbuthnot was a physician, receiving the degree of Doctor of Medicine from St. Andrews in 1696. His medical practice included many leading figures of English society. By chance he provided medical services to Prince George, Queen Anne's consort. As a result he was appointed Physician Extraordinary to the Queen in 1705 and later Physician in Ordinary to the Queen in 1709. The range of his interests beyond his profession were great. Arbuthnot was an amateur musician with connections to the composer George Frederick Händel. He was active in the Royal Society serving on two committees in support of Sir Isaac Newton. He was a political satirist and an excellent conversationalist. Arbuthnot was also the author of eight scientific works which reflect a breadth of interest from mathematics to numismatics to dietetics. Today Arbuthnot is best known as a literary wit, the creator of the character John Bull, and as a close friend and collaborator of the leading writers of the day: Jonathan Swift, John Gay and Alexander Pope.

Arbuthnot's contributions to the development of probability were minor yet indicative of the status of probability as a subject of inquiry in the late seventeenth and early eighteenth centuries. Following the publication of Huygens's (q.v.) *De Ratiociniis in Ludo Aleae* in 1657, very little was published in probability, either in volume or in substance, until Montmort's (q.v.) *Essai d'Analyse sur les Jeux de Hazards* in 1708. Stephen Stigler refers to this time period as the dark ages of the theory of probability.

In 1692 Arbuthnot published *Of the Laws of Chance*, a translation of *De Ratiociniis in Ludo Aleae* with some additions containing probability calculations on various dice and card games. *Of the Laws of Chance* was a popular book. It went through four editions, the last published three years after Ar-

buthnot's death. Each edition was printed by Benjamin Motte, a Tory in politics as was Arbuthnot. The 1692 edition appears to have been one of the first books off Motte's press. Later Motte published the first edition of Swift's *Gulliver's Travels*. *Of the Laws of Chance* was written anonymously as were all of Arbuthnot's writings. Some of Arbuthnot's serious works appear under his own name.

The preface to *Of the Laws of Chance* shows that the book was intended as a gambling manual which perhaps explains its popularity. Arbuthnot probably wrote the book as a means to make money. The first edition was written during a time of personal upheaval for Arbuthnot. His father, an Episcopalian-Jacobite clergyman, had been deposed after the Glorious Revolution (1688) and died three years later. Arbuthnot, who probably intended to follow his father into the Church, left Scotland in 1691 for London where initially he established himself as a gentlemen's tutor in mathematics. The initial 1692 publication on probability falls naturally into a time period when Arbuthnot was apparently viewing mathematics as leading to a possible profession. *Of the Laws of Chance* appeared in a second edition in 1714 and a fourth edition posthumously in 1738.

In 1694 Arbuthnot entered University College, Oxford, as a fellow-commoner where he met David Gregory, Savilian Professor of Astronomy. Both were alumni of the University of Aberdeen. Probably at this time Gregory obtained a manuscript on chance written by Arbuthnot and dated 1694 by Gregory. Arbuthnot may have used the manuscript as his own personal introduction to Gregory. The manuscript contains some generalisations of the work appearing in *Of the Laws of Chance* and an anticipation, including the first use of significance tests, of Arbuthnot's later work on the sex ratio published in 1710 in *Philosophical Transactions of the Royal Society*. The 1710 paper is an attempt using statistics on the relative number births of males and females to demonstrate one aspect of the providence of God.

Arbuthnot's mathematical career ended and his medical career began after he received his medical degree in 1696. There are some possible probabilistic twists to the beginning of this career. Archibald Pitcaime, a Scottish physician, was closely involved in helping Arbuthnot take his doctoral examination. Between 1693 and 1695 Pitcaime tried to apply Huygens's work in probability to medicine, in particular to the secretion of blood and to the cure of fevers. It is likely that Pitcaime's introduction to the work of Huygens was through Arbuthnot.

In philosophy Arbuthnot was a Newtonian, defined by the *Cambridge*

Dictionary of Philosophy as one who has a "view of nature as a universal system of mathematical reason and order divinely created and administered". This is readily apparent in Arbuthnot's preface to *Of the Laws of Chance.* For example at one point in the preface there is a short discussion of providence as it relates to chance or casual events. Later in the preface Arbuthnot states, "all the Politicks in the World are nothing else but a kind of Analysis of the Quantity of Probability in casual Events, and a good Politician signifies no more, but one who is dexterous at such Calculations".

Arbuthnot had a continuing interest in mathematics in general and probability in particular. His library was sold in 1779 and contained at the time of sale the 1718 edition of DeMoivre's *Doctrine of Chances*, DeMoivre's *Miscellanea Analytica* published 1730 and other mathematical books.

Biographical material on Arbuthnot may be found in [1, 7] and his known publications with probability content are listed in [2, 3, 4, 5]. Discussion of his work in probability may be found in [6, 8, 10, 12, 15]. Other references of interest are [9, 11, 13, 14].

References

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