

## Pierre Rémond de MONTMORT

b. 27 October 1678 - d. 7 October 1719

**Summary.** Montmort's fame rests on his *Essay d analyse des jeux de hazard*, which was virtually contemporaneous with Jacob Bernoulli's *Ars Conjectandi* and Abraham de Moivre's *De Mensura Sortis*; and on his collaboration with Nicolaus Bernoulli.

The second of three sons of François Reymond, Écuyer, Sieur de Breviande, and Marguerite Rémond, who were of the nobility, Pierre was born in Paris. He travelled widely in Europe in his youth after giving up the study of law. By 1699 he had returned to France, and came under the influence of Father Nicholas de Malebranche, with whom he studied religion, philosophy, and physics. Over a period of 3 years he and François Nicole taught themselves the new mathematics. He succeeded his elder brother as canon of Nôtre-Dame but resigned in 1706 to marry and settle down at the country estate of Montmort, which he had bought with the fortune his father had left him in 1699. His marriage was a happy one, and during this simple and retired life he set to work on the theory of probability. In 1708, the first edition of his *Essay d'analyse sur les jeux de hazard* appeared "...where with the courage of Columbus he revealed a new world to mathematicians..." according to Todhunter. At the time, Montmort was aware of, and partly motivated by, the work by the Bernoullis (which had been reviewed in 1705 and 1706) on the book that was to be published posthumously in 1713 as Jacob Bernoulli's (q.v.) *Ars Conjectandi*, with a preface by Jacob's nephew Nicolaus Bernoulli (q.v.) (1687-1759). Nicolaus and Montmort had by then evolved an extensive and fruitful technical correspondence. Some of it is included [together with a single letter from Johann Bernoulli (1667-1748)] as the fifth part of the substantially expanded second edition of Montmort's *Essay*, also published, a few months later, in 1713, and prepared with the aid of Nicolaus during a 2-month stay at Montmort's estate. It is clear from the correspondence that the mathematical influence of the Bernoullis (not to mention their contributions) on the second edition, was substantial. Montmort was piqued by De Moivre's (q.v.) *De Mensura Sortis* (the latin precursor of the *Doctrine of Chances*), which appeared in 1711 and which he regarded as plagiaristic. It was, in fact, quite scathing in attacking his own first edition; Montmort retaliated with an *Avertissement* in his second edition. Contrary to popular opinion, the breach was never properly healed.

The value of Montmort's work is partly in his scholarship. He was well-versed in the work of chance of his predecessors (Pascal (q.v.), Fermat (q.v.), Huygens (q.v.)), met Newton on one of a number of visits to England, corresponded with Leibnitz, but remained on good terms with both sides during the strife between their followers. The summation of finite series is an element of Montmort's mathematical interests which enters into his probability work and distinguishes it from the earlier purely combinatorial problems arising out of enumeration of equiprobable sample points. Although the *Essay* to a large extent deals with the analysis of popular gambling games, it focuses on the mathematical properties and is thus written for mathematicians rather than gamblers. The Royal Society elected Montmort a Fellow in 1715 and the *Académie Royale des Sciences* made him an associate member (as he was not a resident of Paris) the following year.

Montmort's best-known contribution to elementary probability is a result connected with the card games *Rencontre*, *Treize*, and *Snap*), in which  $n$  distinct objects are assigned a specific order, while  $n$  matching objects are assigned random order. The probability  $u_n$  of at least one match is now well known to be  $\sum_{j=1}^n (-1)^{j-1}/j!$ . Montmort's general iterative procedure for calculating  $u_n$  is from  $nu_n = (n-1)u_{n-1} + u_{n-2}$ , a difference equation based on a conditional probability argument (given in a commentary by Nicolaus Bernoulli) according to the outcome at the first position.

Montmort also worked with Nicolaus on the problem of duration of play in the gambler's ruin problem, possibly prior to De Moivre, and at the time the most difficult problem solved in the subject. Finally, in a letter of September 9, 1713, Nicolaus proposed the following problems to Montmort:

*Quatrième Problème:*  $A$  promises to give an *écu* to  $B$ , if with an ordinary die he obtains a six with the first toss, two *écus* if he obtains a six with the second toss. . . . What is the expectation of  $B$  ?

*Cinquième Problème:* The same thing if  $A$  promises  $B$  *écus* in the progression 1, 2, 4, 8, 16, . . . .

It is clear that the St. Petersburg Paradox, as subsequently treated by Daniel Bernoulli in 1738 is but an insignificant step away. In his reply Montmort indicates the solution to Nicolaus' problems and describes them as being of no difficulty.

Montmort died of smallpox in Paris in 1719.

## References

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