**De Moivre Revealed**


Over the past decades, not a few mathematicians have been forced out of their homes, exiled, persecuted, or worse. During the heyday (1947–1954) of the House Un-American Activities Committee, mathematical friends who were social activists fled to Canada or to Sweden. And, of course, during the Hitler years European mathematicians sought refuge in all parts of the globe. Such harassment was due not to the mathematical content of their work, but to their political opinions, their actions, or their genealogies.

**BOOK REVIEW**

*By Philip J. Davis*

Harassment is an old story. The first historical case I know of is that of the brilliant neo-Platonist mathematician Hypatia (c. 370–415 CE), daughter of the mathematician Theon Alexandrinus. Involved in a controversy between the Christians and non-Christians of Alexandria, Hypatia was brutally murdered. Hypatia’s life has become a legend, a paradigm for feminists, and it has been much elaborated via artistic renditions, novels, plays, and a journal. Harassment of women mathematicians continues today.

I turn now to the French Huguenot mathematician Abraham de Moivre (1667–1754), who, during the intolerance and dragonade that accompanied the revocation by Louis XIV of the Edict of Nantes, fled to liberal England. Established in England, earning a meager living as a tutor to upper-crust Whigs, getting to know Edmund Halley, the Astronomer Royal, and several years later Isaac Newton, de Moivre became part of the British scientific coffeehouse community. In 1697, with his mathematical talents and bona fides established by his generalization of Newton’s binomial theorem, he was elected a Fellow of the Royal Society.

Who were de Moivre’s scientific contemporaries? Citing only major works, we should list Leibniz, *Acta Eruditorum*, 1684; Newton, *Principia Mathematica*, 1687; Brook Taylor, *Methodus Incrementorum Directa et Inversa*, 1715; Roger Cotes, *Harmonia mensurarum*, 1722 (posthumous); A.C. Clairaut, *Recherches sur les courbes*, 1731. We must certainly not forget Leonhard Euler (1701–1783), of whose works, from a myriad of possibilities, I mention *Introductio in Analyzin Infinitiorum* of 1748. De Moivre was familiar with some of Euler’s results. What a splendid pantheon of talent and what a heady and fundamental brew of mathematics these fellows created!

In 1721, a challenge was thrown out to de Moivre by a certain Alexander Cuming, “an interesting character who had a checkered career,” in the words of David Bellhouse. This challenge, Bellhouse writes, “resulted in one of de Moivre’s major accomplishments . . . the normal approximation to binomial probabilities.” The book traces de Moivre’s development of that work.

I would conjecture that to most mathematicians not in the probability business (a group in which I include myself), the name de Moivre brings immediately to mind his formula $$(\cos (z + iz))^n = \cos (nz) + i \sin (nz)$$ or, in its later and deeper Eulerian formulation, $$\exp (izz) = \cos (z) + i \sin (z).$$ As a matter of fact, de Moivre’s oeuvre goes beyond combinatorics, probability, and actuarial mathematics to what might be called the foundations and the early developments of analytic power and trigonometric series.

Though neglected or downplayed in most histories of mathematics, theology and its relation to mathematics have been in the minds and in the writings of numerous mathematicians of all periods.* As an author famous for his mathematization of chance (his *Doctrine of Chances* appeared in 1718), what did de Moivre think of chance philosophically, so to speak? In a paragraph that has theological overtones, he wrote:

> “And thus in all cases it will be found, that although Chance produces irregularities, still the Odds will be infinitely great, that in process of Time, those Irregularities will bear no proportion to the recurrency of that Order which naturally results from Original Design. . . . Again, as it is thus demonstrable that there are, in the constitution of things, certain Laws according to which Events happen, it is no less evident from Observation, that these Laws serve to wise, useful and beneficent purposes, to preserve the steadfast Order of the Universe, to propagate the several Species of Beings, and furnish to the sentient Kind such degrees of happiness as are suited to their State. . . .”

We have here an early statement that fits in with today’s rampant controversy on “intelligent design,” the theory that the universe and all that is in it could not have originated and developed randomly, but was the work of an intelligent designer. It would be interesting to know how or whether de Moivre’s Huguenot Calvinist background entered into his views. Is intelligent design an aspect of predestination, which was a Calvinist tenet?

Bellhouse, a professor of statistics at Western University, in London, Ontario, has given us in this book a splendidly detailed, background-rich, and well-referenced coverage of de Moivre’s work and life. His presentation is topped off by three pages on a long-neglected fellow: the Reverend Thomas Bayes, of inverse probability fame and notoriety—a subject now all the rage. Bayes espoused the notion of Divine Benevolence, and his theorems have been employed to arrive at the probability that Christian theology is true.

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