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The Statue of the Commander

On the occasion of the bicentennial of Laplace's *Analytic Theory of Probability*

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Though Napoleon's defeat in Russia marked the year 1812, Tchaikovsky's victorious notes in his *1812 Overture* better introduce that year's triumph of a French scholar that

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remains an essential milestone in the history of probability: the appearance of the first edition of Pierre-Simon de Laplace's *Théorie analytique des probabilités* (*Analytic Theory of Probability*). Laplace was born the son of a farmer deep in the Auge region of Normandy in 1749. He surmounted his modest origins and attained great glory by dint of scientific genius. But it must be said that in addition to scientific genius he possessed a gift for politics that permitted him to float above the whirlpools of intrigue of the various governments that followed one upon the other throughout his life. He managed to stay close to the sources of power as a minister in the Consulate, a senator and count during the Empire, an aristocrat during the Restoration. At his death in 1827, Laplace exercised such a command of the sciences of his time (he was often termed a "second Newton") that he remained their patron saint through most of the of the nineteenth century, figuratively guarding his authority over the mathematics and physics of the time just as his statue guarded the entryway of the *galerie des bustes* at Versailles.

After his *Celestial Mechanics*, Laplace's *Analytic Theory of Probability* was the second great work in which Laplace presented his cosmology. He brought to bear in it all the resources of the mathematical analysis that the eighteenth century had brought to a peak of power and efficiency. The relationship between celestial mechanics and probability theory was of course very clear in his mind. He was forced to call upon probability only to deal with gaps that our limited understanding can never totally eliminate. For clearly Laplace is an unshakeable determinist as well as a convinced atheist. Chance for him was just another name for our ignorance. The laws of mechanics have no need whatsoever of any probabilistic extension. The healthy philosophy of scientific and technical progress will expand the limits of our knowledge endlessly, and the calculation of probabilities serves only to permit us to say something about the unknown territory that we have not yet explored.

This magnificent optimism, inherited from the century of Enlightenment that nourished Laplace, would in turn provide the source of many of the nineteenth century's scientific adventures—adventures, and, sometimes, misadventures, for Laplace, very (too?) sure of himself, never hesitated to enter the most treacherous minefields. This was notably true when he sought to mechanize a "science" of ethics by comparing certain human behaviors (such as bearing witness) to the drawing of balls from urns or to other classroom exercises that he used to explain probability. With his towering reputation, Laplace did not pay for this folly. But the same cannot be said for his most immediate successor, Denis-Siméon Poisson, who endured attacks from many of his colleagues. The reputation of probability theory in France did not escape unscathed from such risking undertakings.

All this must not make us lose sight of what is essential. If Laplace's *Théorie analytique* marks a decisive step for probability, it is because it appears as the first systematic exposition of a mathematical theory of probability, with definitions, theorems, and demonstrations, like any other self-respecting mathematical theory. One of the most spectacular aspects of the Laplacian constructions is the perfection of the Bayesian method, which provides a mathematical means for using the occurrence of successive experiences to quantify our knowledge of a phenomenon.

It was precisely the excessive slickness of the mathematical theory that brought back into question many of the practical conclusions that Laplace had proclaimed. Starting already in the 1820s, criticism and reservations about the *Théorie analytique* became appropriate, especially

outside France, where critics could perhaps more easily distance themselves from the memory of the great man.

Laplace's work on probability has already inspired countless commentaries. The journal issue that we present here serves the purpose of recalling the importance of this bicentenary in the history of probability; we do not claim to be definitive. We offer supplements to all that has already been said on the question, notably in the form of certain primary documents. There will unquestionably remain much work to be done between now and 2027, the bicentenary of the death of the great mathematician.

There already being so many commentaries on Laplace's work on probability, the articles in this issue concentrate largely on the reception of that work. **Marie-France Bru, Bernard Bru, and Salah Eid** present the work of a little known mathematician, Hermann Laurent, an impassioned reader of Laplace's treatise in the second half of the nineteenth century, who followed in his steps to apply probability to actuarial science. **Vesa Kuusela** reviews the use of Laplace's work in statistics, notably in the eventful history of Bayesian methodology. **Thierry Martin** discusses the use of Laplace's probabilistic work by French philosophers, who made detailed analyses to justify acceptance or rejection of some of his constructions. Looking through the eyes of Laplace's friend Alexander von Humbolt, **Eberhard Knobloch** examines ways in which Laplace's contemporaries simultaneously respected, feared, and criticized him. The last two articles deal with the important but relatively little known case of English mathematicians' reception of Laplace's work. **Sandy Zabell** studies the specific case of Augustus De Morgan, who aimed to introduce Laplace's work passionately but clearly to the English-speaking world. Finally, **Marie-José Durand-Richard** focuses more widely on the ways in which the French mathematician's work on probability served as an important source of formal algebraic constructions for the nineteenth-century English school.

The documentary section offers three original documents. **Stephen Stigler** presents a very curious unpublished manuscript of Laplace's, "Sur les panorama" (a version of which Laplace inserted in a later edition of his analytic theory), as well as the incredible narrative of this text's journey to the United States. Next, **Franca Cattelani-Degani** introduces a long article by Paolo Ruffini, an Italian mathematician of the late-eighteenth-early nineteenth-century, who composed one of the rare contemporary texts criticizing Laplace for religious reasons while he was still alive. Incidentally, the document was supplemented by a review in 1822 in a French newspaper. Finally, **Bernard Bru** presents the long annotated summary that Joseph Bertrand produced for the republication of Laplace's work during the 1880s. Bertrand's *compte-rendu*, at once admiring and ironic about Laplace's mathematic acrobatics, treats probability theory as amusing and useful but hardly worthy of consideration by a respectable mathematician.