Diogo Pacheco d'Amorim

Diogo Pacheco d'Amorim, born in Monção in 1888, made his elementary and secondary studies in Monção and Braga, and after that entered the Faculty of Mathematics of the University of Coimbra. Although his original purpose had been to get a degree in military engineering, the invitation of his teachers and some disappointment with the army institution led him to change his mind.

He graduated in Mathematics, with the highest possible marks, and began to work in his doctoral dissertation during his final graduation year. In 1914 he presented his doctoral dissertation, *Elements of Probability Calculus*, whose main goal was to solve the sixth problem raised by Hilbert at the World Congress of Mathematicians in Paris, 1900: a rigorous, axiomatic construction of Probability Theory.

His very successful career at Coimbra University — in 1919 he had been appointed Full Professor — shows the general recognition of his merits.

An engaged catholic, he became a militant of the "Catholic Center", and was elected as Member of Parliament during the First Republic, playing an important role in the discussion of economic matters. During Salazar's dictatorship, after a brief period of enthusiasm with the efficiency of Parliament dealings without partisan bonds, his disagreements with internal policies led him to abandon active politics, and to focus once again his brilliance in academic life.

Apart from teaching Probability Theory, he renewed the teaching of Analytical Mechanics, using vector calculus, of Operational Calculus, and of Econometry. His cultural interests were also very broad, but unfortunately his prolific work in Political Economy, History, Philosophy and Religion is dispersed, partially unpublished, and of difficult access.

In order to put in an appropriate frame the importance of Pacheco d'Amorim's work, it is interesting to recall that, in what concerns Probability, the 19th century was a period of of troublesome discoveries.

Laplace's achievements (1812) in developing powerful analytic tools — and namely integral transforms — to broaden the scope of Applied Probability, and his justly famous preface *Essai Philosophique sur la Probabilité* to the second edition (1814) of his *Théorie Analytique des Probabilités*, where he discusses the meaning of Probability[1], started a glorious new period in the

[1]Laplace (1814,p. vij): *"Le premier de ces principes est la définition même de la probabilité qui, comme on l'a vu, est le rapport du nombre de cas favorables à celui de tous les cas possibles. Mais cela suppose les divers cas également possibles. S'ils ne le sont pas, on déterminera d'abord leurs possibilités respectives dont la juste appréciation est un des points les plus délicats de la théorie des hasards."* Laplace's observation on non-equiprobable elementary events, and his remarkable two-stage sampling design known as Laplace urns, clearly show that his deep conception of Probability is much more Bayesian than Laplacian! (Sivia, 1996). The concept of Probability is indeed shaky, and modern axiomatic constructions just take it for granted, a primitive concept of the theory.

development of Probability. As Laplace wrote, in its essence Probability is nothing but common sense reduced to calculation. How dangerous, however, this is: as Descartes writes in the opening paragraphs of *Méditations Méthaphysiques*, common sense is the thing God distributed most evenly: everyone is content with his share!

And by using common "sense" Bertrand (1888) — who did not care much either for Laplacian or Bayesian probability — arrived at several distinct probabilities for the "same"event, namely of a random chord in a circle being larger than its radius. The ambiguity arises, of course, from the subjective interpretation of what is the meaning of "choosing a chord at random". Bertrand's paradox on geometric probability stressed the fragility of 19th century Probability, and it was not surprising that Hilbert, while addressing the World Congress at the turn of the century on the major unsolved problems in Mathematics, included the axiomatic construction of Probability as a pertinent one. Plato (1994) provides much information on the early attempts to tackle this problem, and attributes the first successful results to Bernstein and to von Mises, reporting on their influence on Kolmogoroff's (1933) measure-theoretic approach.

Pacheco d'Amorim (1914) attempted a rigorous construction of Probability Theory based on the concept of "random choice"as a primitive, arguing that it has a non-ambiguous meaning for the one performing the random choice — even though communicating its meaning to anyone else is subject to ambiguity. The axiomatic development of the theory is thus performed starting from this subjective standpoint, a remarkable feat anticipating later developments. Kolmogoroff's construction is of course richer and much more far-reaching both in what regards the definition of expectation and conditioning — but Diogo Pacheco d'Amorim deserves wider international recognition for his work than he has been granted so far. It is unfortunate that at the time there was no pressure whatsoever for international publication, but it would be a valuable service to Portuguese and European culture to prepare an annotated English translation of his dissertation.

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Pacheco d'Amorim did maintain his views on Probability; his course notes show that he was clearly aware of the international developments in the field, but the axiomatic that he uses is still his own.

Pacheco d'Amorim's influence in the development of Probability Theory in Portugal was of the utmost importance. An existing copy of his Course on Probability Theory (1956-7), with personal notes and improvements, is very moving, since it testifies to his commitment to his teaching duties, his drive and motivation to write a modern and "definitive"work on Probability. We can only hope that the edition that it deserves can be accomplished in the near future.

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