# FROM CLASSICAL TO QUANTUM MODELS: THE REGULARISING RÔLE OF INTEGRALS, SYMMETRY AND PROBABILITIES

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ABSTRACT. In physics, one is often misled in thinking that the mathematical model of a system **IS** that system itself. Think to expressions like "point particle", motion "on the line", "smooth" observables, .... On the other hand, when a mathematical model becomes really inoperative in regard with correct predictions, one is forced to replace it with a new one. It is precisely what happened with the emergence of quantum physics. Classical models were (progressively) replaced by quantum ones through quantization prescriptions. These procedures appear often as ad hoc recipes. In the present talk, well defined quantizations, based on integral calculus and symmetry, will be described in simple terms through one of the most basic examples of Mechanics. Starting from probability distribution(s) on the Euclidean plane viewed as the phase space for the motion of a point particle on the line, i.e. its classical model, we will show how to build corresponding quantum model(s) and associated probability (e.g. Husimi) or quasi-probability (e.g. Wigner) distributions. We will highlight the regularizing rôle of such procedures with examples like motions with variable mass, quantum angle or phase, smoothing of classical singular potentials.

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