

A mathematical journey through scales

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The tiny world of particles and atoms and the gigantic world of the entire universe are separated by scales spanning about forty orders of magnitudes. As we move from one to the other, the laws of nature can behave in drastically different ways, going from quantum physics to general relativity through Newton's classical mechanics, not to mention other intermediate "ad hoc" theories. Understanding the way in which the behaviour of mathematical models changes as we move from one scale to another is one of the great classical questions in mathematics and theoretical physics. The aim of this talk is to explore how these questions still inform and motivate interesting problems in probability theory and why so-called toy models, despite their superficially playful character, can sometimes lead to useful quantitative (and not just qualitative) predictions.