

## English summaries

Alejandro Luque

*The parameterization method in dynamical systems*

This paper presents an overview of the parameterization method to study invariant manifolds in dynamical systems. Our purpose is to present the key ideas in a digestible way to the reader not familiar with the topic. First, we will state the general problem of finding invariant manifolds, and then we will discuss specific problems: manifolds associated with fixed points or equilibria; general normally hyperbolic invariant manifolds and invariant tori with quasi-periodic dynamics. The latter problem is included in the so-called *KAM theory*.

**Keywords:** parameterization methods, invariant manifolds, KAM theory, small divisors and not so small ones.

**MSC2010 Subject Classification:** 37C15, 37C20, 34C45, 34D05.

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Elitza Maneva

*P versus NP: the star problem of the mathematics of computation*

The problem “P versus NP” is one of the seven Millennium Prize Problems of the Clay Mathematics Institute, whose solution would be awarded one million dollars. In this article we present in an informal manner the problem and its origin, giving along the way examples of computational problems of different levels of hardness, some non-trivial algorithms, the definition of *Turing machine* — the mathematical model of a computer — and the concept of polynomial reduction between problems. The most advanced part of the

article presents a proof of Razborov's 1985 theorem for monotone circuits, which solves a special case of the conjecture. We also give a translation into Catalan of a letter from Gödel to Von Neumann from 1956 which was discovered in 1988 and can be considered the first written formulation of the problem "P versus NP".

**Keywords:** computational complexity, algorithm, Turing machine, circuit.

**MSC2010 Subject Classification:** 68-02, 68Q15, 68Q17, 68Q05.

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### **Josep Lluís Solé**

*The world of random variables without finite moments of all orders: from the Saint Petersburg paradox to Lévy processes*

Random variables without finite moments of all orders are not at present a pathology, but a central subject in probability theory. From the Saint Petersburg paradox, dated at the beginning of the eighteenth century, until the non-Gaussian stable distributions and Lévy flights, a very beautiful theory has been developed, at which, in this paper, we will take a quick glance. We will finish with some applications to different situations as a taste of the importance of this theory in mathematical modelling. Specifically, we will consider asset prices modelling, the study of earthquakes, a new view to the classical Saint Petersburg paradox, and finally the evolution of the mean temperature in the North Atlantic sea over the last 250,000 years.

**Keywords:** moments, cumulants, laws of large numbers, stable laws, infinitely divisible laws, Lévy processes.

**MSC2010 Subject Classification:** 60-01, 60G51, 60G52.

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