English summaries

Alessio Figalli

On the Monge-Ampère equation

The Monge-Ampère equation is a nonlinear partial differential equation arising in several problems in analysis and geometry, such as the prescribed Gaussian curvature equation, affine geometry, optimal transportation, etc. This equation prescribes the product of the eigenvalues of the Hessian of u, in contrast to the «model» elliptic equation $\Delta u = f$, which prescribes their sum. The goal of this paper is to give a general overview of the classical theory and then discuss some important recent developments in this beautiful topic.

Keywords: Monge-Ampère, convex functions, elliptic regularity.

MSC2020 Subject Classification: 35J96, 35J60.

Carles Lladó and Josep M. Brunat

The mathematics of satins

Satins are a particularly relevant class of fabrics. This paper provides a general framework that identifies a satin with a $\mathbb{Z}^2$ lattice and relates the analysis of satins to classical results in number theory and geometry. Square, symmetrical (in particular rectangular symmetrical and rhombus symmetrical) and concordant satins are dealt with. Fibonacci satins are also introduced, characterizing those that are symmetrical and those that are square.

Juanjo Rué

From classical graph theory to the analysis of large networks

Graph theory currently plays a fundamental role both in pure mathematics and in its applications in many branches of knowledge. In this paper we will retrace the evolution of the research area starting from its origins, through the major discoveries in the discipline, especially those related to the interaction with the notion of randomness. Finally, our journey will conclude by discussing some of the current trends in the theory, which seek to fit the notion of *discrete* (inherent to graph theory) into the realm of continuous mathematics with the aim of addressing the systematic study of the large networks existing in the real world, among other major challenges.