

## English summaries

### Natàlia Castellana

*Once upon a time there was a fixed point...*

One of the classical results we can find in the literature on Algebraic Topology is Brouwer's Fixed Point Theorem, proved using covering spaces techniques, fundamental group calculation and homology groups. In this paper we present a proof based on a lemma from topological combinatorics, Sperner's Lemma, which avoids the techniques mentioned above.

Keywords: algebraic topology, combinatorics, fixed point.

MSC2010 Subject Classification: 55M20, 91A06.

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### Carlos D'Andrea

*Moving curves ideals and their interaction with computer-aided geometric design*

We present a case of fruitful interaction between Commutative Algebra and Computer-Aided Geometric Design. Some challenges in this applied and increasingly important area of informatics have been shifted to abstract algebraic structures, and have enriched Mathematics with several theoretical results and open problems which we explain in this text.

Keywords: rational parameterizations, plane curves, Rees Algebras,  $\mu$ -bases, minimal generators.

MSC2010 Subject Classification: Primary: 14H50; Secondary: 13A30, 68W30.

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**Joan Girbau***Detection of gravitational waves*

The aim of this paper is to present the basic theory of gravitational waves for mathematicians with knowledge of general relativity and explain the methods that can be used to detect them. We will also explain the main characteristics of the astronomical observation made on September 14, 2015 by LIGO's detectors.

Keywords: gravitation, gravitational waves, GW150914.

MSC2010 Subject Classification: 83C35.

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**Joan Carles Naranjo***Geometry in 3D reconstruction*

The goal of this paper is to describe the geometric fundamentals of the 3D reconstruction of a scene using two images obtained from two digital devices. We will start by explaining the camera model and its calibration. Then we will focus on the epipolar geometry which analyzes the relative position between the two cameras. This information is codified by the fundamental matrix in the non-calibrated case, and by the essential matrix in the calibrated case. Finally, we will describe how to effectively reconstruct the scene from the essential matrix.

Keywords: pinhole camera, calibration, fundamental matrix, essential matrix.

MSC2010 Subject Classification: 68T45.

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