



DEPARTAMENTO DE  
GEOMETRIA Y TOPOLOGIA

# Curso

## Programa de Matemática Pura Intertemática



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# LECTURES ON ALGEBRAIC MODELS OF SMOOTH MANIFOLDS

There is a large research program devoted to the study of topological properties of real algebraic sets. The lectures will concentrate on topics whose origins go back to **J. Nash's** celebrated paper "Real algebraic manifolds", published in the *Annals of Mathematics* in 1952. In 1973 **A. Tognoli** obtained a significant improvement upon Nash's result, showing that every compact smooth manifold  $M$  is diffeomorphic to a nonsingular real algebraic set  $X$ . Such an algebraic set  $X$  is called an algebraic model of  $M$ . If  $M$  is of positive dimension, then it has uncountably many pairwise nonisomorphic algebraic models. It becomes important to construct algebraic models with additional desirable properties. There are several beautiful results in this direction due to **Akbulut, Benedetti, Bochnak, Dedo, King, Ischebeck, Schülting, Shiota, Teichner, Tognoli...** They demonstrate that many topological constructions on smooth manifolds can be done in an algebraic-geometric way. However, there are some limitations, which make this subject even more interesting. It turns out that the study of algebraic and topological cycles leads to a demarcation between algebraic and topological categories.

Assuming only basic facts from algebraic geometry and algebraic and differential topology, there will be a self-contained presentation of the theory of algebraic models of smooth manifolds. Many results published only recently, and some that are still in preparation will be included.

## CONTENTS

1. Preliminaries on real algebraic sets
2. Algebraic vector bundles
3. Algebraic cycles and algebraic bordism
4. Nash-Tognoli theorem
5. Relative Nash-Tognoli theorem
6. Algebraic models and vector bundles
7. Ischebeck-Schülting theorem
8. Algebraic cycles algebraically equivalent to zero
9. Algebraic models and algebraic cycles
10. Applications

Organizado por el departamento de Geometría y Topología, el proyecto de investigación *Geometría Real* (MTM2005-02865) y el Instituto de Matemática Interdisciplinar.

**4 noviembre 2008**

**Primera sesión martes 4 de noviembre a las 16h00**

**Se fijarán las fechas siguientes en esta sesión**

**Seminario 225, Facultad de CC. Matemáticas, UCM**