

## English summaries

### **Pilar Bayer**

#### *Poincaré's contributions to arithmetics*

Poincaré's research on fuchsian groups, automorphic functions, etc. is related to that of the German school of his time. The influence of these topics on number theory has increased over the years. Entire chapters of the mathematics of the XIXth century and of the beginnings of the XXth century have found a natural continuation in the present study of arithmetic models, in a way that makes these difficult to understand without taking the classics into account. Poincaré himself considered his contribution to arithmetics as reduced to the theory of forms, but, as we shall see, many others of his works have an important influence on the study of diophantine problems still today.

Keywords: fuchsian group, automorphic (fuchsian) function, abelian function, quadratic form.

MSC2000 Subject Classification: 11-01, 11-03, 11-D, 11-E, 11-G, 14-G.

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### **Sergi Elizalde**

#### *Combinatorics and biology: inference functions and sequence alignment*

In this paper we show examples of applications of combinatorial tools to some problems in computational biology. Statistical models are used to solve

important problems in biology, such as determining which parts of the genome are translated to proteins, or how a DNA sequence evolved into another one through a series of mutations, insertions and deletions. Each possible answer has a certain probability that depends on the model parameters. When these are known, the most likely answer, called *explanation*, is obtained by solving a combinatorial optimization problem. The map that sends each observation to its corresponding explanation is called an *inference function*.

In this paper we give an upper bound on the number of inference functions of any directed graphical model. This bound is polynomial on the size of the model, for a fixed number of parameters, thus improving an exponential upper bound given by Pachter and Sturmfels. Then we apply this bound to a model for sequence alignment that is used in computational biology, and we show that in this case our bound is asymptotically tight.

Keywords: inference functions, graphical models, sequence alignment, Newton polytope.

MSC2000 Subject Classification: 62F15, 52C45, 52B20, 62P10, 52B05.

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## **Paul R. Halmos**

### *How to write mathematics*

In this celebrated article, Halmos exposes his personal view, full of common sense, on several issues related with the writing activity in mathematics, either of a global character (planning, organization, attitude towards readers) or of more local import such as language usage, notation, punctuation symbols, etc.

Keywords: writing, style, exposition, communication, organization.

MSC2000 Subject Classification: 00A99.

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## **Josep Pla i Carrera**

### *The algebra of paper folding*

This paper, following the example of the ruler and compass geometrical constructions, analyzes the lines and points that can be obtained with paperfolding. The kernel of the work is a general definition of paperfolding geometrical constructions. Three geometries of the plane are produced by appropriate concretions of one of the constructions: the geometry of ruler and metric

transporter, that of ruler and compass and, finally, the geometry of ruler, circle and conic sections. Then, the paper proves that the latter corresponds to numerical solutions of cubic and quartic equations.

**Keywords:** constructible geometry, ruler and compass, paper folding, algebra of paper folding, origami.

**MSC2000 Subject Classification:** 51-01.

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