

# MATH MATTERS 2007-2008

IMA Public Lecture Series [www.ima.umn.edu/public-lecture](http://www.ima.umn.edu/public-lecture)

All Lectures are  
at 7:00 pm  
125 Willey Hall

## TUESDAY OCTOBER 9, 2007

*Bernd Sturmfels, University of California - Berkeley*

### ALGEBRA, STATISTICS, COMPUTATION, AND BIOLOGY

Recently, algebraic methods have been developed to unify and advance a variety of techniques of statistical analysis, providing new and improved tools for computational biology. Professor Sturmfels, one of the founders of the new field of algebraic statistics, will introduce the subject and describe its emerging applications to genome science and developmental biology. He will be assisted by a fictional character named DiaNA who plays hopscotch and rolls tetrahedral dice with faces labeled "A", "C", "G", and "T".

## THURSDAY NOVEMBER 1, 2007

*Screening of the film Achieving the Unachievable with the film's writer/director Jean Bergeron*

### U.S. PREMIER SCREENING OF THE DOCUMENTARY FILM "ACHIEVING THE UNACHIEVABLE"

M.C. Escher is among the most mathematical of artists. In 1956 he challenged the laws of perspective with his graphic Print Gallery, and found himself trapped by an impossible barrier. His uncompleted master-piece quickly became the most puzzling enigma of modern art, for both artists and scientists. Half a century later, mathematician Hendrik Lenstra took everyone by surprise by drawing a fantastic bridge between the intuition of the artist and his own, and completed Escher's work mathematically. This story is presented in 52 minute film *Achieving the Unachievable* by documentary filmmaker Jean Bergeron. After the screening, the film's U.S. premier, Bergeron will be available to answer questions.

## WEDNESDAY FEBRUARY 13, 2008

*Alfio Quarteroni, Ecole Polytechnique Fédérale de Lausanne (Lausanne, Switzerland) and Politecnico di Milano (Milan, Italy)*

### MATHEMATICAL MODELING IN MEDICINE, SPORTS, AND THE ENVIRONMENT

Mathematical models are enabling advances in increasingly complex areas of engineering and technology. Recent developments in multiscale geometrical modeling have opened the way to progress in modeling such complex systems as the human circulatory system and the climate system. Professor Quarteroni leads a team which has harnessed mathematical modeling to design improved cardiac surgical interventions and to optimize the design of the twice winning America's cup yacht *Alinghi*. He will talk about this work, and their efforts to confront some of the great environmental challenges that face us.

## TUESDAY MARCH 4, 2008

*Ivar Ekeland, University of British Columbia*

### THE BEST OF ALL POSSIBLE WORLDS: THE IDEA OF OPTIMIZATION

The idea of optimization is intimately connected with modern science. Pioneers like Galileo, Fermat, and Newton, were convinced that the world had been created by a benevolent god who had established the laws of nature as the most efficient way to achieve his purposes: in short, this is the best of all possible worlds, and it is the task of science to find out why and how. Gradually this view was overturned, leaving optimization as an important tool for the human-engineered world. More recently, game theory has come to replace optimization for describing situations where a multitude of individuals with conflicting interests make decisions based on imperfect information. In this lecture, Professor Ekeland will guide us along the path from Fermat to modern economic theory, and from optimization to game theory.